

kilobaud

March 1981
US\$5.95 CAN \$6.00

T.M.

MICROCOMPUTING

DESKTOP COMPUTERS

The H-89: Putting It All Together



Heath's
Do-It-Yourself
Computer



Which Business Computer Is Right for You? ☐ 6800 Secrets ☐ Electric
Crayon Shows Its True Colors ☐ Cheap, Dumb Apple ☐ North Star Data-
base Manager ☐ Twice-As-Quick Fix for the OSI ☐ PET Shorthand Complete

Big Savings for SS-50 Bus Computerists



LFD-400 Mini-Disk System

\$459.95

**Save
\$140!**

The choice of knowledgeable 680X computerists since 1977 • Proven clock-data separation circuitry and other superior design features • Reliable hard-sector diskette formatting • Stores up to 102 Kbytes of formatted data on 40 tracks • Comes complete with 4-drive controller, drive assembly, 6800 or 6809 ROM disk operating system, interconnecting cable and comprehensive users manual • Add-on drives cost only \$399.95 each.

✓ 14 REGULAR \$599.95

SBC/9 Single-Board Computer

\$139.95

A computer or a fully compatible SS-50 bus MPU card • Interchangeable 6802 or 6809 processor • Extendable 1-Kbyte ROM monitor • Parallel and serial I/O ports — selectable, full-range bit rate generator for serial I/O • Extendable addressing • On-card 1-Kbyte RAM • Provision for additional EPROM • On-card voltage regulator circuits

REGULAR \$199.95

**Save
\$60!**



6809 MPU Upgrade Adapter

\$39.95

Upgrades 6800 MPU cards to 6809 processing power • Configured for SWTP MP-A2 MPU card but may be used with other MPUs • Plug-in installation requires no trace cutting or soldering — easy to restore MPU to original configuration • Assembled and tested • Includes user instructions • 6809 ROM operating system, PSYMON/A2, for use with the 6809 MPU Adapter — \$69.95.

**Save
\$30!**

✓ 245 REGULAR \$69.95

The ELECTRIC WINDOW™

\$169.95

Memory-mapped instant display updating • Software-defined display formats • Expandable 128-symbol character generator — characters are fully formed and feature true baseline descenders • On-card display RAM can be remapped • Video output can be composite or separate sync-video • Voltage regulation circuitry included on card. For an application review of the ELECTRIC WINDOW, see Peter Stark's comments on page 87 of the January 1981 issue of Kilobaud MICROCOMPUTING.

REGULAR \$249.95

**Save
\$80!**



Percom Price-Slashing, Profit-Zapping Fifth Anniversary Sale!

After five years of solid accomplishments, it's time to celebrate. So we've slashed prices for a gigantic 5th anniversary sale. Now, for a limited time, you can get Percom design and Percom quality at enormous savings. But don't wait. Sale ends April 30th and quantities are limited to stock on hand.

Save \$100.00 on fully assembled, tested and burned-in RAM cards! Hurry, regular prices in effect after April 30th.

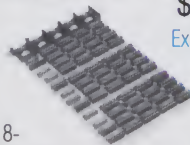
These RAM cards feature 1-Mbyte extended addressing; buffered data, address and control lines; and, on-card voltage regulation. Cards are fully tested and burned-in. User manuals include 6800 & 6809 diagnostic memory test programs.

M24SS 24-Kbyte STATIC RAM CARD

\$399.95 REGULAR \$499.95

**Save
\$100!**

Memory is organized as three independent 8-Kbyte blocks. Each block may be located at any 8-Kbyte boundary of a 64-Kbyte address space • Also



available in 8- and 16-Kbyte versions at regular prices. 8-Kbyte RAM expansion kit includes **extra** RAM chip, plus sockets and other parts. Kit price is \$139.95. • Uses 2114L RAM chip.

✓ 204

M48DSS 16-Kbyte DYNAMIC RAM CARD

\$399.95 REGULAR \$499.95

**Save
\$100!**

Expandable to 48 Kbytes • Memory is organized as three independent 16-Kbyte blocks. Each block may be located in any of the four 16-Kbyte zones of a 64-Kbyte address space • Special "map-out" strapping can be used to depose any 8-Kbyte block from upper 32-Kbyte memory • Uses type 4116 RAM chips • 16-Kbyte RAM expansion kit includes **extra** RAM chip, plus sockets and other parts. Kit price is \$99.95. ✓ 69

Watch for the COLORAMA-50!

This soon-to-be-announced color VDG card for the SS-50 bus features eleven colorful display formats in 2 to 8 colors, plus 2-color alpha-numerics; full graphic resolutions from 64X64 pixels to 256X192 pixels; memory-mapped instant display control; low-cost modulator option for TV interface; 1-Mbyte extended addressing; cassette I/O option; and, operating software. Introductory price is only \$219.95.



PERCOM DATA COMPANY, INC.
211 N. KIRBY GARLAND, TEXAS 75042
(214) 272-3421

PRICES AND SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE
PRICES DO NOT INCLUDE SHIPPING AND HANDLING.

COLORAMA 50, ELECTRIC WINDOW, LFD-400, PSYMON and SBC 9 are trademarks of Percom Data Company, Inc.

Nobody supports the SS-50 bus like Percom

Our field-proven software for 680X computers includes monitors, operating systems, drivers, editors, assemblers, debuggers and high-level languages like Super BASIC — our popular extended disk BASIC interpreter.

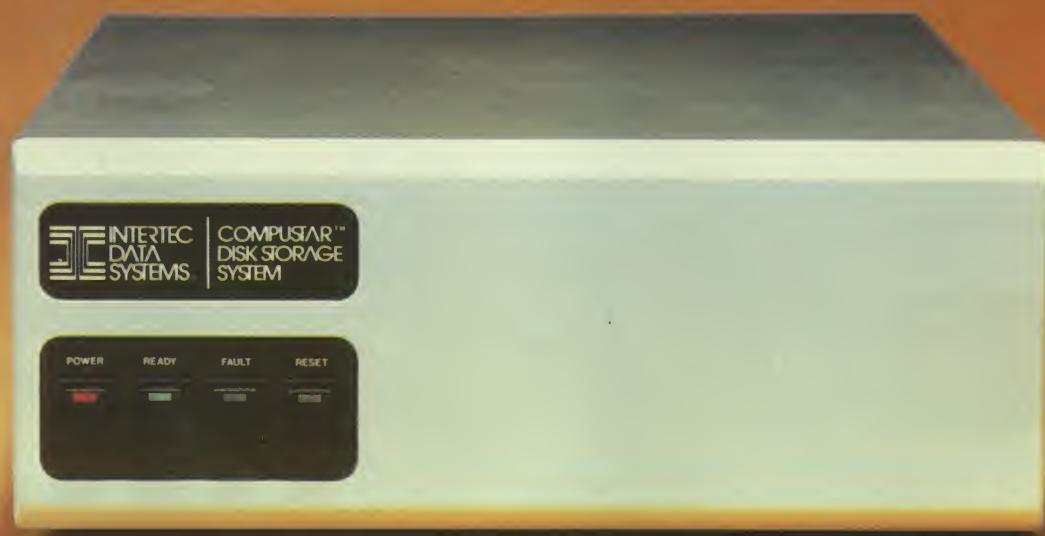
Some of the other hardware products available include versatile prototyping cards in both 30- and 50-pin versions, extendable 50-pin motherboards and 30-pin I/O card motherboards. Function cards, prototyping cards and motherboards are optionally available with gold-plated bus connectors. Also, most function cards are available in 86-pin, EXORciser bus compatible versions.

Quality Percom products are available at Percom dealers nationwide. **Call toll-free, 1-800-527-1592, for the address of your nearest dealer, or to order direct from Percom.**

EXORciser is a trademark of Motorola Corporation.

SOLVE THE STORAGE SHORTAGE

with ten multi-user megabytes



CompuStar's 8-inch Winchester



Intertec's exclusive 255 User Controller



CompuStar Cable Assembly

If you could think of just one way to improve our phenomenally popular SuperBrain, what would it be? More disk storage? Well, we already thought about it. And for only a few thousand dollars for a whopping 10 megabytes of lightning-fast storage, it's nothing short of another major breakthrough! From the company that wrote the book on price/performance . . . Intertec.

Our New CompuStar™ 10 Megabyte Disk Storage System (called a DSS) features an 8 inch Winchester drive packaged in an attractive, compact desktop enclosure. Complete with disk, controller and power supply. Just plug it into the Z80 adaptor of your SuperBrain and turn it on.* It's so quiet, you'll hardly know it's there. But, you'll quickly be astounded with its awesome power and amazing speed.

*Some models require hardware/software modification.

The secret behind our CompuStar DSS is its unique controller/multiplexor. It allows many terminals to "share" the resources of a single disk. So, not only can you use the DSS with your SuperBrain, you can configure multiple user stations using our new series of CompuStar™ terminals, called Video Processing Units or VPU's™.

Four CompuStar VPU's are available. At prices starting at less than \$2,500. Some models are designed to operate as stand-alone microcomputers, with internal disk storage. Just like your SuperBrain. Each model features its own 64K of RAM and can be "daisy-chained" into a powerful multi-user network. Just connect one VPU into the next. Using easy-to-install cable assemblies. Connect up to 255 users in a single system. One at a time. As you need them.

Whether you need an extra 10 megabytes for your SuperBrain or an enormous multi-user network, the CompuStar™ DSS solves your storage shortage problems. Sensibly. And economically. Plus, your investment is protected by a nationwide service network with outlets in most major U.S. cities. Providing efficient on-site or depot maintenance.

Get a demonstration of this extraordinary new system today. Call or write now for the name and address of your nearest CompuStar dealer.

**INTERTEC
DATA
SYSTEMS**

2300 Broad River Rd. Columbia, S.C. 29210
(803) 798-9100 TWX: 810-666-2115

✓3

MICROCOMPUTING

PUBLISHER/EDITOR

Wayne Green

EXECUTIVE VICE PRESIDENT

Sherry Smythe

EDITORIAL MANAGER

Jeff DeTray

PUBLICATIONS MANAGER

Edward Ferman

MANAGING EDITOR

Dennis Brisson

ASST. MANAGING EDITOR

Susan Gross

COPY EDITOR

Eric Maloney

EDITORIAL ASSISTANT

Linda Stephenson

ADMINISTRATIVE ASSISTANTS

Cresca Clyne, Pat Graham, Nancy Noyd

ASSOCIATE EDITORS

Robert Baker, Ken Barbier, Frank Derfler, Jr., Rod Hallen, Peter Stark, Sherm Wantz

MANUFACTURING MANAGER

Noel Self

PRODUCTION MANAGER/PUBLICATIONS

Nancy Salmon

ASST. PRODUCTION MANAGER

Michael Murphy

ART DIRECTOR

Diana Shonk

PRODUCTION DEPARTMENT

Joan Ahern, William Anderson, Jr., Steve Baldwin, Linda Drew, Robert Drew, Bob Dukette, Bruce Hedin, Kenneth Jackson, Ross Kenyon, Maryann Metivier, Theresa Ostebo, Jane Preston, Dion Owens, Patrice Scribner, Suzanne Self, Susan Symonds, Thomas Villeneuve

PHOTOGRAPHY

William Heydolph, Terrie Anderson, Bill Sutfenfield

TYPESETTING

Barbara Latti, Sara Bedell, Michele DesRochers, Luann Keddy, Mary Kinzel, Linda Locke, Karen Podzycki

CORPORATE CONTROLLER

Charles Garniss, Jr.

PLANT MANAGER

Leatrice O'Neill

ACCOUNTING MANAGER

Knud Keller

CIRCULATION MANAGER

Debra Boudrieau

CIRCULATION

Doris Day, Pauline Johnstone

BULK SALES MANAGER

Ginnie Boudrieau

PUBLIC RELATIONS

Joseph Wilson

ADVERTISING

603-924-7138

Kevin Rushalko, Mgr.

Marcia Stone, Hal Stephens

APPLICATIONS

38 Dollars and Sense Gene Embry

Lets you convert dollars to English when writing checks.

86 Database Manager for the North Star John E. Bailey

North Star

Puts you in control of your data files.

106 Protect Your Files from Prying Eyes Phil Hughes

6800

You hold the key with data encryption.

130 Tracking the Planets Dr. E. Stanton Maxey

Calculating planetary orbits with the S-100.

BUSINESS

116 An Adventure in Free Enterprise Forest E. Myers

Start your own mailing label business.

120 Microcomputer Selection and Implementation Bruce T. Pace

Guidelines to help you choose the right computer for your business.

CONSTRUCTION PROJECTS

28 Building the H-89 Martin Moore

Heath

A computer, terminal and mass-storage device—all in one.

GENERAL

124 Astrology and the Microcomputer Dr. J. Lee Lehman

Stargazing enters the computer age.

GRAPHICS

83 Dots Incredible! James J. Conroy

TRS-80

Create your own custom character sets.

HARDWARE MODIFICATIONS

65 Cheap, Dumb Apple Bill Hubbard

Apple

An ultra-economical data communications connection.

112 Faster Baud Rate for the Superboard II James A. Antonelli

OSI

Save and load at 600 baud.



Page 28.

Page 72.



REVIEWS

- Michael B. Roberts **Meet the Electric Crayon** 72
Add color graphics to your computer.

SOFTWARE MODIFICATIONS

- Apple II Kenneth Miles **Auto-Menu for the Apple II** 68
Easy access to your disk contents.
- B. Antony Paturzo **MAT Functions** 138
These BASIC routines make arrays easy to handle.
- PET Gary L. Ratliff **PET Shorthand Compleat** 144
Use abbreviated keywords for more efficient programming.

TUTORIAL

- Richard Fritzon **Write Your Own Pseudo-FORTH Compiler** 44
Follow-up to last month's interpreter article.
- 6800 Peter A. Stark **Thoughts on the 68XX System** 94
Real-time clocks, video boards and EPROMs.

DEPARTMENTS

- | | |
|--------------------------|----------------------|
| Publisher's Remarks-6 | Calendar-148 |
| PET-pourri-8 | Classifieds-150 |
| Computer Blackboard-12 | Dealer Directory-152 |
| Letters to the Editor-16 | New Products-180 |
| Dial-up Directory-18 | New Software-186 |
| Micro Quiz-20 | Computer Clinic-190 |
| Micro-Scope-22 | Clubs-190 |
| As the Word Turns-24 | Book Reviews-192 |

This month:

Our March issue features part one of a comprehensive article on the Heathkit All-In-One Computer, the H-89. Beginning on page 28, H-89 owner Martin Moore describes his experiences in constructing the machine and getting it up and running. If you've been contemplating the purchase of an All-In-One, you'll appreciate his commentary. Next month's follow-up article will take a look at H-89 software.

Building your own computer wasn't always so easy. Of course, back in the Dark Ages (1975), the *only* way to acquire a working micro was to do it yourself. Even then, you could expect to spend weeks or months debugging the system before it performed properly. One of the reasons Wayne Green started *Kilobaud Microcomputing* was to help the early pioneers share fixes and tips.

When Heath Company's teaser ads first appeared in the summer of 1977, many of us waited with considerable interest to see what Benton Harbor had wrought. The H-8 was finally unveiled in the autumn, and some were disappointed that Heath had not selected the S-100 bus. Others disliked Heath's choice of split octal notation. Still, the H-8 *was* a Heathkit, which meant you had an excellent chance of assembling it successfully. Now in its fourth year, the H-8 is still a good value.

With the All-In-One, Heath has stepped squarely into that market segment dominated by Radio Shack, Apple and Commodore. More importantly, however, they've done this without denying H-89 owners the satisfaction of saying, "I built it myself!"

—The Editors

This month's cover:

The Heathkit H-89 All-In-One Computer.
Photo by Martin Paul.

Page 120.



Page 124.

Kilobaud Microcomputing (ISSN 0192-4575) is published monthly by Wayne Green, Inc., 80 Pine St., Peterborough NH 03458. Subscription rates in U.S. are \$25 for one year and \$53 for three years. In Canada: \$27 for one year only, U.S. funds. Foreign subscriptions (surface mail)—\$35 for one year only, U.S. funds. Foreign air mail subscriptions —\$62 for one year only, U.S. funds. Canadian Distributor: Micron Distributing, 409 Queen St. West, Toronto, Ontario, Canada M5V 2A5. In Europe, contact: Monika Nedela, Markstr. 3, D-7778 Markdorf, W. Germany. South African Distributor: KB Microcomputing, PO Box 782815, Sandton, South Africa 2146. Australian Distributor: Electronic Concepts, Attention: Rudi Hoess, 55 Clarence Street, Sidney 2000, Australia. Second-class postage paid at Peterborough NH 03458 and at additional mailing offices. Phone: 603-924-3873. Entire contents copyright 1981 by Wayne Green, Inc. No part of this publication may be reprinted or otherwise reproduced without written permission from the publisher.

Built-in Computer Serviceman



Self Servicing

One of the things you discover when you computerize any business operation is that computers have a tendency to fail. The second thing you find out is that once the computer stops, your business stops, too. All your employees who were entering data are now on an extended coffee break. All the people who were filling orders generated by the computer are playing games. The office workers who had been word processing are gossiping. A computer breakdown in even a small business can cost you several hundred dollars an hour—plus the aggravation of trying to catch up again once it is back on line, and several hours of work have to be done on overtime.

To give you an idea of what can happen, let me draw upon my own bitter experience. We put in a Prime computer, complete with expensive environmental controls. But things do go wrong. An air conditioner may fail, increasing the temperature a few degrees and thus stopping the whole system for a day or two. We have to protect against heat, cold, dryness, wetness, static, and so forth, with tolerances far more exacting than you'll find in the average business office.

The Prime suddenly stopped working one day. Since we had a maintenance contract, we called the firm for service. The home plant is less than an hour's drive from us, so we expected fairly prompt service—hours, maybe, but a couple of days at the most. Several months later, the system was finally back in full working order.

While Radio Shack has been making some positive strides toward providing service for their systems, few other manufacturers have the sales or means to make quick service available.

For a computer to be of any real value to a business, it must work in an office environment, not be sealed in a scientific

lab with environmental controls. It should be able to work through chance power outages without faltering. And when something does go wrong, it should be repairable in minutes rather than hours.

There are several alternatives to providing this kind of service. One is to have traveling servicemen who can come to your office to fix the system. This is the system used by IBM, and it works fairly well. When one of my typewriters that is on service contract stops working, I know that I'll have it going within a day or two—except on weekends, which is when my typewriter usually stops. The serviceman has to be able to fix the system on the spot, which is not too difficult for typewriters, but might be more of a problem for computers, which may require sophisticated test equipment. The computer serviceman would probably need a van instead of a car.

In the old TV-repair system, a driver picked up the set, drove it to a service center for repairs and then returned it. This method solves the test equipment and test technician problem, providing more repairs per hour when the tech does not have to drive for an hour to the office site. But this means that your service centers will have to be set up no more than 100 miles apart if you are going to keep trips down to 50 miles or less—which is still at least a two-hour trip for each pickup and delivery. A 100-mile round trip is not going to be inexpensive, adding perhaps \$100 to the service call by the time you add in everything. This is not going to be popular.

Another alternative is to have the businessman bring in the computer for repairs. It will cost him a lot less to make that 50-mile trip, and he'll get it done quicker. The computer system is relatively light and easy to move, so this might be a viable alternative. However, since businesses are not used to this, it might not be easy to sell. Repairmen

come in to fix their typewriters, copiers and other office equipment, so there might be considerable resistance to having to bring the computer to the lab.

The computer is different from other office equipment in one important way. When a typewriter breaks down, there is no way that it is going to be able to fix itself, or even diagnose its own problems. The office copier, when it gets a piece of paper stuck in its gullet, will not respond to the Heimlich maneuver. It requires an expert to pull that wad out. The computer, on the other hand, can be built and programmed to take its own pulse and let you know what is ailing it.

Compugraphic was the first firm that I know of to figure this out. For a bit extra you can buy a service kit along with their computerized typesetter. Thus, when something goes wrong, you pull out the kit and start making simple tests. The kit has repair boards for you to replace if that is called for, and you then send the bumper in by UPS for replacement.

Microcomputers can be built for servicing, with simple-to-reach plug-in boards. Diagnostics that will check for memory errors, CPU problems, power supply problems, etc., can be included with the system. The important thing is to start building the servicing of our systems into the systems. In this way we will be able to provide a far more valuable office tool.

Our office computers should have protection against loss of power. This may come as a battery floating on the line to be used in case of emergency. It might only take the form of a large capacitor which would store enough energy to allow the system to quickly store work in progress for later retrieval.

Perhaps it will be possible for a system of remote diagnostics to be designed which can be done over the phone line via a modem. How service is done is not as important as the speed (high) and the costs (low).□

WHY TAKE A CHANCE WITH YOUR ADVERTISING?

RISK

RISK

CALCS-III™ COURT
COST \$24.95

PROPERTY TAX
PAY \$200

AIDS-III™ AVENUE
COST \$69.95

DATALIFE™ DRIVE
COST \$26.95

FILE BOX
FOLLOW CODE ON DISKETTE

PLAIN JANE™ PARK
COST \$21.95

COLLECT \$20,000 WHEN YOU
SELL

YOU DON'T TREAT YOUR BUSINESS LIKE A GAME . . .

And neither do we. META MEDIA can help you reach your market more effectively and for less money than you may think you have to spend. Business is risky enough. Why not deal with people who understand products for small computers and how to sell them. You have a lot at stake . . . time, money, your future. Why roll the dice?

Meta Media Productions, Inc. ✓ 333

26111 Brush Avenue Euclid, Ohio 44132

(216) 289-1100

We Accept: VISA/MasterCard

DATALIFE is a TM of VERBATIM
AIDS-III, CALCS-III and PLAIN JANE are TM of MTC
©1981 by Meta Media Productions, Inc.

META MEDIA PRODUCTIONS, INC. is an affiliate of META TECHNOLOGIES CORPORATION, INC.

Handy Utilities

Make life easier
for you
and your PET

Pro-Kit #1

This utility package for the PET is a collection of machine code routines that can be permanently located in a protected area at the top of the PET's memory. Once installed, writing programs to accept information from the keyboard is as simple as using INPUT commands, but as safe as a GET routine involving the most comprehensive validation checks. The Pro-Kit routines are called by a few simple POKE and SYS commands. They can easily be incorporated into your own programs, and the authors (Intex Datalog Limited, Eaglescliffe Industrial Estate, Eaglescliffe, Stockton-on-Tees, Cleveland TS16 0PN England) are willing to negotiate terms for using their routines in programs offered for sale.

The simplest routine is the date input routine, which allows inputting a date in a standard format. Only valid dates are accepted; all other inputs are ignored by the routine. It checks for an invalid day for the particular month specified and even handles leap years correctly. The specific format required is a set of three pairs of two-digit numbers representing the day, month and year in that order. This routine is called by a SYS command and returns the date entered as a string in QS.

A general input routine allows you to specify the maximum length of the entry field and which of the printable characters are to be accepted as valid input. This routine is used for inputting any information that is not a date or a decimal number. To use the routine, you first define a string VCS that contains each character which the routine will allow as input. Then you poke location 1 with the maximum number of characters you want in the entry field. The routine is called by a SYS command, and the data entered from the keyboard appears in QS padded with trailing spaces if necessary.

For numeric input, another routine allows you to specify how many numbers you want before and after the decimal

point and whether or not negative numbers are allowed. Before calling this routine you must poke locations 910 and 911 with the number of digits before and after the decimal point. Then poke location 912 with a zero if only positive numbers are allowed, or with a one if positive and negative numbers are allowed. The routine is called by a SYS command, and the user's input value is returned as a properly formatted string in QS.

The number input routine has a default input value of zero. If you enter a number followed by a decimal point, pressing the decimal point immediately formats the integer part of the field in the proper position. If you enter a small integer number without pressing the decimal point before pressing RETURN, the value returned in QS may not be the correct value. This is due to the default characters displayed on the screen in the entry field area. This condition can be avoided by pressing the right-bracket (]) key instead of RETURN. This deletes all characters from the current cursor position to the end of the input field.

If you enter numbers right up to the decimal point, the next number entered automatically goes into the position after the decimal point without pressing the decimal point key. When no numbers are entered prior to the decimal point, QS is padded with spaces plus a leading zero. Negative numbers are indicated by pressing the minus sign at any time during the input before pressing RETURN.

Another useful routine allows searching a string in S2\$ for a matching substring specified in S1\$. A similar search in BASIC could take up to 2.5 seconds, but this routine is almost instantaneous. The routine is called by a SYS command after setting S1\$ and S2\$ to the appropriate values. Location 32767 then contains a number indicating the starting character position where a match was found in S2\$. If the value in 32767 is zero, no match was found.

This routine makes it simple to implement single-key mnemonic responses to

a menu without lots of "IF AS="XYZ" THEN..." statements. Instead, you just define S2\$="NSEWUD" (or whatever answers are valid) and use a GET statement to receive the option letter in S1\$. Then call the PROKIT routine via the correct SYS command and branch to the desired option by a simple "ON PEEK (32767) GOTO..." command.

For proper operation of the Pro-Kit routines, the PET must be in the upper/lowercase mode (POKE 59468,14). In this mode, a string in QS displayed in uppercase on the screen would appear as either graphics or lowercase on the printer. A graphics conversion routine, called by the proper SYS command, will convert the contents of QS to the proper format for being printed as it would appear on the screen.

In all Pro-Kit entry routines, as RETURN is pressed the entry field changes from reverse to normal and a thin line (|) is placed to the right of the entry field. The input routines assume that your entry fields are normally shown with a surrounding box formed using the family of shifted @|123+0 characters.

Another function common to all Pro-Kit entry routines is the action caused by pressing the RVS key instead of RETURN. This acts just like a RETURN, but location 32767 is set to a one instead of a zero. The appearance of a one in this location can then be used as an indication that something special should happen in the program after the entry is made. For example, it could mean to step back to the previous input instead of continuing to the next expected input.

Another three routines provide various screen-exchange functions. One routine takes whatever is displayed on the screen and dumps it in a specified area of memory. The second does the reverse, bringing back an area of memory to be displayed on the screen. The last routine exchanges an area of memory with the screen display. Before calling this routine by the SYS command, you must poke six memory locations. Two locations specify

IF YOU CAN WAIT A MINUTE, WE CAN SAVE YOU \$1,000.

**With the Starwriter™ Daisy
Wheel 25 cps printer from C. Itoh.**

A business letter, written on a 45 cps word-processing printer, might take about two minutes to print.

With the Starwriter, it might take closer to three.

The typical 45 cps printer retails for about \$3,000.

But the Starwriter 25 retails for about \$1,895—thus saving you about \$1,000.

And therein lies the biggest difference between the Starwriter 25 and the more expensive, daisy wheel printers.

The Starwriter 25 comes complete and ready-to-use, requiring no changes in hardware or software. It uses industry-standard ribbon cartridges, and it's "plug-in" compatible to interface with a



wide variety of systems, to help lower system-integration costs.

Using a 96-character wheel, it produces excellent letter-quality printing on three sharp copies with up to 163 columns, and offers the most precise character-placement available, for outstanding print performance.

C. Itoh's warranty:

3 months on parts and labor, supported by one of the best service organizations in the industry.

\$1,000 OFF

**Leading Edge Products, Inc.,
225 Turnpike Street,
Canton, Massachusetts 02021**

Dear Leading Edge:

I'd like to know more about the Starwriter, and how spending a minute can save me a grand. Please send me the name of my nearest dealer.

Name _____
Title _____
Company _____
Street _____
State _____ Zip _____
Phone: Area Code _____
Number _____

LEADING EDGE.

✓ 355

Leading Edge Products, Inc., 225 Turnpike Street, Canton, Massachusetts 02021
Dealer inquiries invited. For immediate delivery from the Leading Edge Inventory Bank™ call toll free 1-800-343-6833
In Massachusetts, call collect (617) 828-8150. Telex 951-624

the start of the memory area to be used while the other four locations determine which of the three screen exchange functions is to be performed. It is the user's responsibility to change the BASIC top-of-memory pointers to protect a suitable area of memory for the desired application.

The Pro-Kit routines can be easily incorporated into your own programs. However, the suggested method of saving a program with Pro-Kit is to save all RAM using the monitor. Thus, each program will be 32K long and take about 125 blocks on disk. You can save just the program as normal without Pro-Kit, but then you have to load Pro-Kit separately each time the program is loaded.

This package of routines is handy and very impressive, but the assumed formats may or may not be what you would

like. The printed documentation is clear and complete, with various exercises to explain the operation of each routine. The programs are available on disk or cassette with additional demo programs included. They're all written for the 3032 PET (a 2001 with BASIC 3.0) and will not run with the BASIC 4.0 ROMs or on the 8016/8032 machines.

Utility Programs

I recently received a collection of various utility programs for review from California Software Associates (Box 969, Laguna Beach, CA 92652). I've included information on two of the programs I was able to try.

EDIT is a BASIC program that allows editing or appending to sequential or user diskette files on the 2040 disk. The edit function acts on files in place on the diskette, so records are limited to the original record length. When appending records to an existing file, the new records are limited to 80 characters per record. In either mode, colons and commas are ignored.

When the program is run you are asked for the desired filename and the disk drive number. The program then locates and traces the file chaining on the disk by track and sector. The number of blocks in the file and the number of free blocks on the disk are both displayed. For large files this can take some time (3.5 minutes, worst case), but it only occurs once. All following actions should be virtually instantaneous.

After all the initial setup is complete, you are asked whether you want to EDIT, APPEND or STOP. If you accidentally choose STOP, a RETURN will reenter the program. When you select EDIT you're asked for the record number to be edited. You can enter the exact record number, an exclamation point or RETURN to exit edit mode.

After entering a record number between one and the maximum record number, the program displays the current contents of the record with an up-arrow under the first character position. Once you position the up-arrow to the appropriate starting position, you simply type in the desired edit. Inserts into a full record delete any trailing characters, while deletes append trailing spaces. If you try to type beyond the end of the record, the last character of the record equals the last character typed. There is no wrap-around, and you cannot change the size of the record. When satisfied with the changes, hitting RETURN causes the new record to replace the original record in the file.

If you respond to the edit record number prompt with an exclamation mark, you are then asked for a search string of up to 80 characters in length. Leading question marks in your search string

function as "don't care" or "wild card" characters. No character matching is performed in these positions. A sequential search of the file is performed, looking for a match but only up to the length of the search string specified. Any trailing characters in the file record are ignored.

If the search is successful, editing proceeds as outlined previously. Otherwise, if the search fails, you will be asked again for an edit record number. Searching through long files can be rather slow. If you know about where the record is, using several record number guesses is much faster.

When appending new records, you are prompted for each new record with a maximum length of 80 characters. The delete key functions as normal while the cursor movement keys are disabled. You can add records to the limit of the block availability on the diskette. The appended records can later be edited, but they cannot be deleted once entered.

SNAPSHOT is a machine-language screen utility program that allows saving and restoring up to ten different copies of the CRT display. On the 2001 series PETs the program occupies the first and second cassette buffers, so neither cassette may be used while it is in place. It is normally compatible with BASIC as well as most other utilities such as WEDGE/DOS, TOOLKIT, EXTRAMON, etc. The program will usually notify you and abort if there is a utility in place with which it is not compatible. Various versions are available for each model PET/CBM and for the different ROM sets.

SNAPSHOT is loaded and run after all other utilities are loaded. It first asks for the maximum number of pages to be saved. If there isn't enough memory available, an error message is displayed and you get to try a smaller number. Otherwise, the program initializes itself and displays the number of bytes remaining for BASIC along with simple calling procedures for the program.

SNAPSHOT can only be called from the upper-left corner, or cursor-home position, of the screen. The first character in the call must be either an exclamation mark or an equal sign. The second character must be an allowable page number or an "X" (to deactivate SNAPSHOT). Each call is terminated with a RETURN, and any other data on the first line is ignored. An exclamation mark is used to copy the current screen contents to the section of RAM reserved for the indicated page number. An equal sign is used to recall a snapshot of the screen. The section of RAM reserved for the indicated page number is copied back to the screen.

Any SNAPSHOT call leaves the cursor in the cursor-home position so you can easily cycle through current snapshots of the screen. Once a snapshot has been taken, control is returned to BASIC command mode in the same condition as prior to the SNAPSHOT call. Thus, im-

FIFTY BUS SYSTEMS

32K 6800s from \$1694.59

32K 6809s from \$1844.69

Include: Chassis, CPU, 32K Static Ram, I/Os Fully Expandable

2114L 300ns STATIC RAM CHIPS ..\$5.90

FACTORY PRIME From the same shipment we use in our professional quality boards. Add \$5.00 Handling on Orders Under \$200.00

32K STATIC RAM BOARD FOR THE SS50 AND SS50C BUS (SWTP etc.)

- SS50C Extended Addressing (can be disabled).
- 4 separate 8K blocks
- Socketed for 32K
- Gold Bus Connectors
- Low power 2114L RAMS
- Write Protect

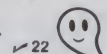
16K \$328.12

24K \$438.14

32K \$548.15

Phone, write, or see your dealer for details and prices on our broad range of Boards and Systems for the SS50/SS50C BUS including our UNIQUE 80 x 24 VIDEO BOARD, and our AC Power Control Products for all computers.

GIMIX INC.



1337 W. 37th Place • Chicago, IL 60609 (312) 927-5510 • TWX 910-221-4055

The Company that delivers.

Quality Electronic products since 1975.

GIMIX® and GHOST® are Registered Trademarks of GIMIX INC.

16K UPGRADE

\$39⁹⁵

TRS80 —
KEYBOARD
APPLE II
TRS80 III

TRS80 —
EXP. INTERFACE
SORCERER
TANDY COLOR
COMPUTER

FACTORY FRESH 200 ns 16K RAMS FOR MEMORY UPGRADE. KIT INCLUDES FULL INSTRUCTIONS AND COMPONENTS TO ALLOW EASY 16K CONVERSION IN MINUTES. WHY PAY DOUBLE FOR THE SAME PARTS THE MANUFACTURERS USE?

ALL PARTS CARRY A FULL 12 MONTH WARRANTY. ADD \$2.00 POST AND PACKAGING; TEXAS RESIDENTS ADD 5% SALES TAX. CHECK OR MONEY ORDER ACCEPTED.

IAN ELECTRONICS 209

P.O. BOX 14079

AUSTIN, TEXAS 78761

mediate commands can be executed, programs run or continued, etc.

Although SNAPSHOT saves and recalls images of the PET screen, it does not save any line-wrapping (linking) information when the snapshot is taken. Similarly, SNAPSHOT does not change the line wrapping (linking) in effect before a snapshot is recalled. This can cause unpredictable or undesirable results if certain precautions are not taken if you intend to use any snapshot line as an immediate BASIC command or a program line. When SNAPSHOT is deactivated by an "IX" call, the BASIC CHRGET routine and the IRQ vector in low memory are restored to the BASIC cold-start condition. This may deactivate other utilities, but BASIC is left untouched.

I found both programs to be very handy and encountered no problems with either. The EDIT program can be purchased separately for \$60 or as part of a complete disk utility package for \$100. The utility package also includes:

MESSAGE—which allows editing disk blocks, updating the disk block availability map (BAM), scanning files, mapping the disk, tracing block linkage, etc.

RECOVER—which recovers scratched files.

SNAPSHOT sells for \$25, and there are different versions for the various models and ROM sets as mentioned. On all programs sold by California Software Associates, there is an update service available.

Word Pro Disk Files

With the many valuable features of Word Pro, it's not surprising that more and more programs are using Word Pro to create input data or utilize their output data. In fact, there's no real reason why your own programs can't interface to Word Pro as well. It's really quite simple once you know the disk file format and character set used by Word Pro.

All disk files saved or read by Word Pro are actually program files with a load address as the first two bytes of the file. With Word Pro 3 the actual address is 5108 hex and is stored in the normal 6502 address format (low byte first—08; high byte last—51). The file then contains the actual text with any embedded control commands stored exactly as displayed on the screen. Each line is stored as 40 bytes regardless of its contents; there is no compacting of the data. If the only thing on the line was a RETURN (stored as a back-arrow), it would be stored as the RETURN followed by 39 spaces. If you are using Word Pro 4, then remember that there will be 80 characters per line instead of 40.

Now for the tricky part! The value stored for each character in the file is the same value as used in the screen RAM when the PET is in the upper/lowercase

mode (POKE 59468,14). These are the same values you would normally use when poking values directly into the display. Remember that the value used to generate a specific character can be different depending on the character set that is active—upper/lowercase or uppercase graphics. Since Word Pro 3 forces the upper/lowercase mode, we'll only be concerned with that character set.

Since Word Pro uses the OFF/RVS key to enter control mode, you cannot generate reverse characters. This limits the character set used by Word Pro to only 128 characters. There are really only 123 usable characters, since five characters are reserved for special purposes (RETURN, begin/end underline or enhance, tab, toggle uppercase lock). Table 1 shows the decimal and hex value of each character as stored/read by Word Pro.

If you want to read a file created by Word Pro (or by another program in Word Pro format), simply open the file as a sequential read file (OPEN 1,8,1,"O:filename,S,R). Read and ignore the first two characters, which represent the load address for the program file. Then read the data using a GET#1,CS (or similar) command and translate the data into the normal character set if necessary.

To write a file for Word Pro or in the Word Pro format, first open the file (OPEN 1,8,1,"O:filename,P,W). Now write the normal Word Pro load address: PRINT #1,CHR\$(8);CHR\$(81); followed by any

desired data. Remember to write the correct value for each character and always use the ending semicolon on the print statement. This will write individual bytes of data in the format desired.

Miscellany

Espon's new MX-80 printer offers a multitude of features normally unexpected in a low-cost printer. With an available IEEE-488 interface and an optional graphics ROM, it can easily be used with the PET. If you should decide to buy an MX-80, however, be sure you get the correct interface module. There were apparently two IEEE-488 interface boards—a model 8160 and an 8161. Only the 8161 board will work correctly with Word Pro. The original 8160 board will not handle all PET printing modes correctly.

If your company or organization is offering products of interest to PET/CBM owners, I'll be happy to review them here as space permits. Reviews are generally done in the order received. If you'd like something reviewed and timed to appear with a product announcement, please remember the typical three-month lead time for this column. As always, any and all correspondence is welcomed but should be addressed to me at my home address (15 Windsor Drive, Atco, NJ 08004). An SASE is appreciated if you expect a response. □

Dec	Hex	Char	**	Dec	Hex	Char	**	Dec	Hex	Char	**	Dec	Hex	Char
0	00	@		32	20	space		64	40	shift-@		96	60	shift-~
1	01	a		33	21	!		65	41	A		97	61	!
2	02	b		34	22	"		66	42	B		98	62	"
3	03	c		35	23	#		67	43	C		99	63	#
4	04	d		36	24	\$		68	44	D		100	64	\$
5	05	e		37	25	%		69	45	E		101	65	%
6	06	f		38	26	&		70	46	F		102	66	&
7	07	g		39	27	'		71	47	G		103	67	'
8	08	h		40	28	(		72	48	H		104	68	(
9	09	i		41	29	)		73	49	I		105	69)
10	0A	j		42	2A	*		74	4A	J		106	6A	*
11	0B	k		43	2B	+		75	4B	K		107	6B	+
12	0C	l		44	2C	,		76	4C	L		108	6C	shift-,
13	0D	m		45	2D	-		77	4D	M		109	6D	-
14	0E	n		46	2E	.		78	4E	N		110	6E	.
15	0F	o		47	2F	/		79	4F	O		111	6F	shift-/
16	10	p		48	30	0		80	50	P		112	70	0
17	11	q		49	31	1		81	51	Q		113	71	1
18	12	r		50	32	2		82	52	R		114	72	2
19	13	s		51	33	3		83	53	S		115	73	3
20	14	t		52	34	4		84	54	T		116	74	4
21	15	u		53	35	5		85	55	U		117	75	5
22	16	v		54	36	6		86	56	V		118	76	6
23	17	w		55	37	7		87	57	W		119	77	7
24	18	x		56	38	8		88	58	X		120	78	8
25	19	y		57	39	9		89	59	Y		121	79	9
26	1A	z		58	3A	:		90	5A	Z		122	7A	(wp-cmd)
27	1B	[		59	3B	;		91	5B	+		123	7B	shift-;
28	1C	(up-case)		60	3C	<		92	5C	=		124	7C	(bea-ul)
29	1D	]		61	3D	=		93	5D	!		125	7D	!
30	1E	|		62	3E	>		94	5E	@		126	7E	(end-ul)
31	1F	(tab)		63	3F	?		95	5F	shift-?		127	7F	?

Table 1. Decimal and hex values of Word Pro characters. The commands are indicated by a value of 122 (7A hex) in the first column of any display line. The command then follows with each character in the command as shown in the table. The uppercase lock is enabled/disabled by the value of 28 (1C hex). A value of 31 (1F hex) indicates a tab. The values of 124 (7C hex) and 126 (7E hex) begin and end underlining or enhancing, respectively.

First Impressions Are Forever

Get off to a
good start
with computers

First-Day Success

First impressions are important whenever you meet someone. First impressions are also important whenever someone meets a computer. Every effort should be made to make the first few experiences of the new computer user enjoyable. An enjoyable, successful first experience for students can go a long way toward making their future attitude regarding computer use a positive one. A successful first experience for teachers is almost a necessity if you want them to continue to explore the educational potential and reality of microcomputers in their classrooms.

During the late 60s and early 70s many interested, capable teachers were nearly, if not completely, convinced that computers could have little impact on classroom activities. These teachers had heard about time-sharing terminals connected to minicomputers and perhaps

seen a few enticing demonstrations. Their curiosity was aroused, so they enrolled in an introductory computing course in a local college or university.

That was the beginning of their decline. Many were taught to keypunch in preparation for batch processing. After all, the local college didn't yet have time-sharing terminals, "but the principles are all the same." Many others were taught FORTRAN, COBOL or RPG, because that's what the local college staff was prepared to teach. And still others were taught bits, bytes and assembly language because higher-level languages were less prestigious.

For the teacher seeking to explore classroom applications of computing facilities, these courses were, and still are, a disaster. They left the course convinced that computing, as they had experienced it, was of no use in their classroom. And they were right! Most unfortunately, those aspects that were appropriate for

the classroom remained beyond their experience, and their now negative attitude was likely to keep it there.

Don't let a similar scenario adversely affect the positive potential of the microcomputer. College and other courses that use other than microcomputer hardware, that do not teach beginners BASIC or that do not provide hands-on experience are very likely doing more harm than good when the courses are billed as appropriate introductions for educators. The educational potential of the \$1000 microcomputer far exceeds that of other forms of computer support that is realistically available to today's elementary and secondary schools. If teachers are willing to take courses to improve their skills, they should not be given inappropriate material because that's the only thing available. Teachers should seek those courses that will provide the introduction they need, and must not settle for less.

On a much smaller scale, teachers should strive to make a student's first few computer experiences positive and rewarding. One very common way to do this is to allow students to begin by playing one or two popular games. This is only acceptable if the game is carefully chosen; it must be user-proof. The inexperienced user should be able to type absolutely anything without seeing an error message. The game must not be invincible. A first-time user should be more likely to win than lose. There is little reward in having a computer beat you in four out of four games, especially if they're the only four games you've ever played with the computer. The game must be exceptionally easy to understand, and the game should be fun.

One program that meets these qualifications asks the user to guess a secret integer between 1 and 100. Each incorrect guess is indicated as too high or too low. After the number is guessed correctly, the roles are reversed and the computer guesses a number made up by the user. Listing 1 contains a TRS-80 version of

```

100 CLS : PRINT @256, "I'M THINKING OF AN INTEGER BETWEEN 1 AND 100 INCLUSIVE"
110 PRINT : PRINT "TRY TO GUESS MY INTEGER"
120 CLEAR 200 : L=0 : H=101 : N=RND(100) : GOSUB 400
130 CLS : PRINT @256, "YOUR GUESS " : INPUT G : G=VAL(G)
140 IF G<0 OR G>INT(G) OR G>100 THEN PRINT "PLEASE USE INTEGERS BETWEEN
1 AND 100" : GOSUB 400 : GOTO 130
150 IF G<L THEN PRINT "YOU ALREADY KNOW MY NUMBER IS HIGHER THAN" L :
GOTO 200
160 IF G>H THEN PRINT "YOU ALREADY KNOW MY NUMBER IS LOWER THAN" H :
GOTO 200
170 IF G<N THEN PRINT "TOO LOW" : L=G
180 IF G>N THEN PRINT "TOO HIGH" : H=G
190 IF G=N THEN PRINT @256, CHR$(23)+"YOU GOT IT! GOOD WORK!"
200 GOSUB 400 : IF G<N THEN GOTO 130
210 CLS : PRINT @256, "NOW WE'LL REVERSE THE PROCESS"
220 PRINT @384, "YOU THINK OF AN INTEGER BETWEEN 1 AND 100 INCLUSIVE,"
230 PRINT "AND I'LL GUESS IT"
240 L=0 : H=101 : L1=1 : H1=100 : GOSUB 400 : GOSUB 400
250 G=INT((L+H)/2)
260 CLS : PRINT @256, "I GUESS" G : PRINT
270 INPUT "AM I (H)IGH, (L)OW, OR (R)IGHT?" : R$
280 R$=LEFT$(R$,1):IF R$<>"H" AND R$<>"L" AND R$<>"R" THEN GOTO 270
290 IF R$="H" THEN H1=H : H=G
300 IF R$="L" THEN L1=L : L=G
310 GOSUB 400 : IF G=L1 OR G=H1 THEN CLS : PRINT @256, "YOU'RE NOT GIVING
ME CONSISTENT ANSWERS" : PRINT "LET'S TRY THIS PART AGAIN" : GOSUB
400 : CLS : GOTO 220
320 IF R$<>"R" THEN 250
330 CLS : PRINT @256, CHR$(23)+"THAT WAS FUN -- I LOVE NUMBERS!" : GOSUB
400
340 CLS : PRINT @256, "HOPE YOU ENJOYED THIS EXERCISE" : PRINT
350 PRINT "I'LL BET YOU WRITE BETTER ONES PRETTY SOON"
360 GOSUB 400 : GOSUB 400 : END
400 FOR I=1 TO 1000 : NEXT I : RETURN

```

Listing 1. Number-guessing game for the TRS-80.

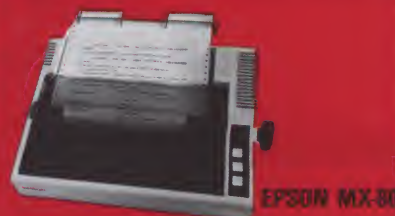
GO WITH A WINNER!

**THE
STOCKING
SOURCE**

**Buy Only
From a
"Factory
Authorized
Source"**



EPSON MX-70

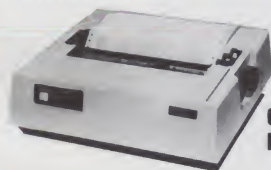


EPSON MX-80



ANADEx
DP-9500

PRINTERS



Okidata
Microline 82

List Price Your Cost

NEW — Okidata
Microline 82 . \$ 960. **Ask For
Our Price \$800**
Features: 80 C.P.S.;
Bidirectional; Full forms
Control; Choice of
Parallel or Serial Inter-
face as Standard; Buff-
ered Serial Optional

Epson Model
MX-70 \$ 495. **Ask For
Our Price**
Features: 80 C.P.S.;
Unidirectional; Bit Plot
Graphics; Adjustable
Sprocket from 4" — 10"

	List Price	Your Cost
Epson Model		Ask For
MX-80	\$ 645.	Our Price
Okidata		Ask For
Microline 80 . \$ 800.		Our Price \$550
Anadex DP-9500 &		Ask For
DP-9501 \$1650.		Our Price
Anadex		Ask For
DP-8000 \$1095.		Our Price \$895

INTERFACES —

Epson Apple Plug-in	
Interface & Cable	\$110.
Epson Serial	
Interface & Cable	\$ 90.
Epson IEEE 488	
Interface & Cable	\$ 80.
Model TRS-80 Expansion	
Interface Cable	\$ 35.
Model 232 Universal	
CA Cable, Universal	
Serial Interface	\$ 25.
Okidata Microline	
80 Tractor	\$100.

Okidata Microline 80
RS-232 Interface with 256
Character Buffer \$170.

SYSTEMS FURNITURE —
We stock Systems Furniture
tables.

PRINTER STANDS —
We stock Universal printer
stands for most printers.

COUPLERS & MODEMS —
We handle the broad Tek-Com
line.

BREAKOUT BOX

	List Price	Your Cost
NEW — HAYES		Ask For
TECHNICAL \$195		Our Price
Full RS 232 Breakout and Patching Interface Box		



**ASK FOR OUR
INSTANT DISCOUNT**
From Roy Hawthorne
Talk To Bill Tokar On
Applications

CALL TOLL FREE
U.S.A.
1-800-521-2764
MICHIGAN
1-800-482-8393

Reminder:
We are open
8:30 AM to 5:00 PM EST
Monday through Friday

WRITE TO:
"The Stocking Source" ✓ 288
NEW 24069 Research Drive
Farmington Hills, MI 48024
313-474-6708

this program. You'll have to type the program to see a sample run.

Notice that the program attempts to deal with all possible incorrect user responses by providing helpful messages. The user should never be faced with a BASIC error message or a prematurely terminated program. Note that line 130 uses a string variable when a numeric value is expected. This allows the user to enter anything without seeing the ?REDO message. Also notice that large letters are used as a change-of-pace reward. While this is a very simple example, programs should make the reward worth the effort. Finally, notice that the program doesn't allow the user to lose nor does it evaluate his performance. Although both of these elements are often desirable, neither is necessary in the student's first experience with the computer.

After the successful completion of a game or other interactive program, the first-time user can be introduced to programming. Although the first programs will not be elegant, they should be fun. The following sequence of first-encounter programs is suggested because they introduce new commands and elementary programming concepts in a way that is easy, fun and likely to lead to many other interesting questions.

Have the students enter and run the following initial program:

```
10 PRINT "JULIE"
20 GOTO 10
```

They should, of course, enter their own first names. This allows the introduction of line numbers, three commands (counting RUN), strings and the break key. Since almost everyone wants to see their name in lights, the program is fun.

The second program is a modification of the first. The string in line 10 should contain two spaces after the name and then be followed by a semicolon. This program appears as:

```
10 PRINT "JULIE ";
20 GOTO 10
```

Execution of this program always brings delight. And when done in an area with several microcomputers available, the effect is greatly enhanced. On the TRS-80, the program will fill the screen with JULIE and appear to be moving to the left. However, the name TOM will

move to the right, while the name WALTER will produce relatively dull columns that aren't moving at all.

Why do some names move left, some right, and some not at all? I've asked these questions of first-time users from third grade through adults who have answered correctly in each instance. Even third-grade students correctly answer the question. Although they haven't had formal instruction about division, they can correctly explain the results of this program by describing the division process and the remainder in their own words.

Another program for those learning to program is:

```
10 LET N=1
20 PRINT N
30 LET N=N+1
40 GOTO 20
```

This program is an effective vehicle for introducing the LET command. Ask students how to begin counting at 1000 rather than 1. Ask them how to count by 2's, by 5's, or how to count down.

Also, ask students to determine approximately how much time the computer will take to get to one million. After all, a device that measures time in microseconds should certainly be able to count from one to one million very rapidly.

The results of this assignment are almost always surprising (a TRS-80 requires about 8-1/2 hours to count from one to one million in this way), and the students' own activities as they develop procedures for obtaining their results are quite valuable. There are several related points that should be discussed. The most significant of these, in my opinion, is the largeness of large numbers. Very few children or adults have any intuitive feeling regarding large numbers. Most people watching this program being executed will guess that one million will be reached in two hours or less.

One million is a lot larger than we think. When the news reports that a new plane costs eight million dollars, someone is spending a lot of money. When the national debt exceeds one trillion dollars, we know that's a large number. But we have little feeling for how very large it really is. How long would it take our short program to count from one to one trillion?

Another topic often occurs when the more advanced student points out that he added the line 40 IF N<10000 THEN 20 to make it easier to time the program. That this command also consumes time during each loop should not be overlooked. How much time? I'll leave that as an exercise for the reader.

Secondary students might also calculate the time required for the following program to count from one to one million.

```
10 LET N=1
20 LET N=N+1
30 GOTO 20
```

Consider one more example. This one is for the many teachers and students whose first computer experience should not include numbers if enjoyment is an objective. The dependence upon sample programs that draw heavily on mathematical examples is not at all necessary. The TRS-80 program given in Listing 2 is a bare-bones version of a rather enjoyable game that we'll call Word Squeeze.

Word Squeeze begins by asking you to type a five-letter word that is alphabetically between "above" and "zebra." After you type your word, the program determines the shortest alphabetic "distance"—above to your word or your word to zebra. Suppose you typed the word "class." The alphabetic distance from above to class is shorter than that from class to zebra.

After the program determines which words define the shorter distance, the user must enter a word that is alphabetically between them. If, for example, you typed class, then you would next be asked to type a word that is alphabetically between above and class. If you responded with the word "break," you would next be asked to type a word that is alphabetically between break and class. And on and on.

In the Listing 2 program, the user does not win or lose Word Squeeze, he just plays. The program is offered as a starting point to which you can add many bells and whistles of your own. You might, for example, permit words of three or more letters rather than only using five-letter words. You might also check that each word entered contains at least one vowel and at least one consonant. Certainly, you can improve the scoring procedure, and you ought to provide a method for the user to quit more gracefully than pressing break.

Make every effort to make the first experiences of new users enjoyable ones. The ideas offered in this article hopefully demonstrate that these experiences can be not only enjoyable, but also challenging and stimulating. If you've some similar ideas that have worked for new users, send them in. Perhaps the best ones will be appropriate for a future column. □

```
100 L$="ABOVE" : H$="ZEBRA" : C=0
110 FOR X=1 TO 800 : NEXT X : CLS
120 PRINT @256, "TYPE A 5 LETTER WORD THAT IS ALPHABETICALLY" : PRINT
    "BETWEEN " L$ " AND " H$ " :
130 PRINT @768, C " ENTERED SO FAR" : PRINT @349, : INPUT N$
140 IF LEN(N$)<>5 OR L$>N$ OR H$<N$ THEN PRINT @448, "NO, TRY AGAIN"
    : GOTO 110
150 C=C+1 : IF C=15 THEN 200
160 FOR I=1 TO 5
170 N=ASC(MID$(N$,I,1))
180 A=N-ASC(MID$(L$,I,1))
190 B=ASC(MID$(H$,I,1))-N
200 IF A<B THEN H$=N$ : GOTO 110
210 IF B<A THEN L$=N$ : GOTO 110
220 NEXT I
```

Listing 2. Word Squeeze program.

Address correspondence to Walter Koetke, Putnam/Northern Westchester BOCES, Yorktown Heights, NY 10598.

New muscle for Heathkit Computers

*Now with new CP/M® Systems Software
for thousands more programs...and new
8-inch disk system for millions more bytes.*



The Heathkit All-In-One Computer now has space for 64K of addressable RAM, so you can run bigger, more complex programs.

And our new CP/M® Operating System (Standard *ORG-0*, Version 2.2) makes thousands of CP/M programs available to you. Heathkit systems can run more, do more, store more than ever before.

A new 8-inch double-sided, double-density disk system, with over 1 million bytes per drive, is now available for Heathkit H-89 and H-8 Computers.

The new 8-inch disk system features soft-sectored disks for IBM® compatibility. It's capable of operating in standard IBM 3740 format. And the 8-inch sys-

tem can be used in conjunction with 5¼-inch systems. **For compatibility with the rest of the industry, Heathkit Computers may just be the most flexible systems you can buy.**

All Heathkit computers and peripherals are available in money-saving, easy-to-build kit form — or completely assembled and factory tested. All are supported by the best documentation in the business and by 62 service centers throughout the U.S. and Canada. You're never out in the cold.

For complete details and prices on Heathkit computers, peripherals and software, write today for the latest Heathkit Catalog or visit your nearby Heathkit Electronic Center*.

VISIT YOUR HEATHKIT STORE

Heathkit products are displayed, sold and serviced at Heathkit Electronic Centers*, located in major cities throughout the U.S. and Canada. See your white pages for the store nearest you.

*Units of Veritechnology Electronics Corporation, in the U.S.



Send for FREE catalog

Write to Heath Company, Dept. 351-754,
Benton Harbor, MI 49022

In Canada, contact Heath Co., 1480 Dundas St. E.,
Mississauga, Ontario L4X 2R7

Heathkit®

236

IBM is a registered trademark of International Business Machines Corporation. CP/M is a trademark of Digital Research, Inc.

LETTERS TO THE EDITOR

Warning for Superboard II Users

If you own an Ohio Scientific Superboard II microcomputer and your power supply output is limited to 3 amps (such as a homebrew LM323K circuit), check the Superboard's fuse F1. I recently received my Superboard and hooked up an overvoltage protect crowbar circuit by clipping the crowbar's +5 V lead into the fuse clip (along with the fuse end) that is connected to the load side of the fuse (Superboard's +5 V bus). The crowbar was initially set to fire at too low a voltage, and fired one day when I was using the computer. However, fuse F1 did not blow, resulting in an extremely hot LM323.

The reason? As supplied, F1 was a 5 amp, 250 V fast blow fuse. The LM323's output current is limited to 3 amps, and so couldn't blow the 5 amp fuse. I was fortunate, as my crowbar circuit caused the short and I was right there to check it out. The real danger is a shorted IC on the Superboard, with no one around. The LM323 will just keep feeding 3 amps into the short until power is removed or something literally burns up, probably destroying the board.

I read in an article titled "Build a Home for Your Superboard" (April 1980 *Microcomputing*, from where I also got the crowbar circuit) that an 8K Superboard draws about 1.8 amps. Therefore, a 2 to 2.5 amp, fast blow fuse will hold, but definitely not larger than a 3 amp if you're using a 3 amp supply. I have a 4K Superboard and am using a 2 amp fast blow.

Ron Hassinger
RAF Chicksands, England

Paradoxical Processing

Your comments about word processing in the November issue ("Word Processor Woes," p. 7) touched one of my nerves, resulting in this letter. Several months ago my office took delivery of an NBI 3000 Word Processing System. This electronic phenomenon has produced more paradoxes than I possibly could have foreseen. For example:

The system produces documents of unbelievable quality, mostly due, however, to the excellent Diablo printer.

The turn-around time for a normal two-page proposal letter, from dictation to final document, has not decreased, but rather has almost doubled.

The freedom associated with the easy editing and correct capabilities has resulted in more relaxed and productive dictation and transcription sessions.

Although well-written, the operator's guide serves more as a reference manual, rather than as a training guide. Consequently, finding how to do something that isn't done very often is difficult and time consuming.

Every letter now goes through a "draft" stage, whereas many letters used to get typed only once, and then signed and mailed.

Many difficult typewriter functions have been simplified to a few keystrokes on the word processor. This, however, is offset by the fact that many easy typewriter functions, such as the "hanging indents," have become more complicated or time consuming.

The word processor doesn't replace a typewriter, but is still needed for many pre-printed forms or short notes.

The confounded machine picks the absolutely worst times to fail. It always happens at 3 PM as the almost-final draft of a twelve-page document (that must be mailed today) is being printed.

While the list could go on, I think it sufficiently expresses my frustrations. I am pleased with the professional quality that word processing lends to my correspondence and documents. I like the flexibility that word processing offers. I think the per-station costs are too high, but these will come down sharply over the next couple of years. I have a difficult time accepting the fact that while some tasks became easier, many other, more often used tasks became more cumbersome. But, no matter how well the letter is printed, regardless of the technology used to produce the document, in spite of the time and effort invested, the Post Office will still manage to lose it, mis-deliver it or destroy it!

Roland K. Smith
Datapoint Eastern Region
Sales Manager
Cleveland, OH

Megabytes on Cassette

A product has been on the market now for about a year that does just what you asked for in your November 1980 "Publisher's Remarks" (New Ideas, p. 8)—that is, allow the storage of 10 megabytes of Winchester data on a regular cassette.

The Corvus Mirror is a low-cost backup for the Corvus Winchester disk system employing standard video recording technology. It converts the output of the Corvus 10 or 20 megabyte Winchester disk into a stream of serial bytes which can be recorded on any videotape recorder. The most common video machine used for this purpose is the video cassette recorder because it offers the convenience

and low cost of easily available cassettes.

Data is backed up at a one megabyte per minute rate, permitting the entire contents of a Corvus Winchester disk to be copied in 10 to 20 minutes. Total capacity of a cassette is 120 megabytes. Thus, the Mirror serves not only as a security backup, but also provides archival storage. In a larger sense, it allows microcomputer users to enjoy both the sealed environment reliability of the Winchester disk system and the convenience of cassette loading at the same time by re-loading cassette data back onto the disk as needed.

Joseph D. Hughes
Vice-president, Marketing
Corvus Systems, Inc.
San Jose, CA

A Change in the Standings

Here's some new information that changes some of the data in your recent article "The 16-Bit Time Trials" (*Kilobaud Microcomputing*, October 1980, p. 182).

The Z8000 CPUs are now available from both Zilog and Advanced Micro Devices in 6 MHz clock rate versions (called the 8001A and 8002A). Use of the A version reduces cycle times to two-thirds that of the 4 MHz parts, resulting in execution times and rankings in your Table 2 of 32 us (#1) for table lookup, 712 us (#3) for block move, 5.3 us (#1, tie) for jump table and 13.3 us (#3) for multiply. The execution time index changes to 0.596 (#2), and the overall index changes to 0.799, which makes the Z8000 number one in rank.

John Springer
Advanced Micro Devices, Inc.
Sunnyvale, CA

All Shapes and Sizes

Arnold Bragg's article "Area Estimation" (October 1980, p. 112) showed an amazingly effective algorithm for its simplicity. Its greatest weakness is that only straight lines (not curves) are fitted between the data points.

To test the formula for its ability to fit curves, I used a circle with the radius of 1 and chose the data points so they were equally spaced around the circumference. For comparison, I also calculated the area of an N-sided inscribed polygon. The area determined by the formula is always the area of the inscribed polygon.

Fitting a curved line is more of an inconvenience rather than a fault of the al-

gorithm. Any inconvenience the fitting creates is more than made up for by the algorithm's ability to fit very complex shapes. The only time the algorithm failed was for the ring figure, and I tried to do the outside and the inside area in one pass. This could easily be handled by making two passes—one for the outside and the second one for the inside—and then subtracting the differences.

Bob Fruit
Hinsdale, IL

A Sound Idea

It seems to me that it would be fairly easy to rig up one of the popular microcomputers to print stenotype which puts the sounds of words on paper, from voice. You would need something to recognize phonemes (the Radio Shack Vox Box might do) and a special character generator of stenotype symbols for the video display and/or printer. The software would amount to a lookup table to make the proper conversion.

Three of the four major television networks are now captioning some of their programs for the deaf. But captioning costs about \$2500 per hour. If the deaf can learn to read stenotype, then the captions could be produced automatically.

A deaf person with his own steno-converter wouldn't need broadcast captions.

He wouldn't even be limited to television; he could "hear" the radio, the telephone and people in the room too. When all this is boiled down into a handheld unit—the size of the TRS-80 Pocket Computer, say—he could use it wherever he is, eliminating much of his disability.

The hardware for a home system is already available, or nearly so. The software should be easy. There should be a reasonable market for it (don't forget secretaries typing from recordings). Any takers?

Everett Ogden
Delmar, NY

Inflation

I've followed you for the last 25 years through many troubled times, and I always enjoy your editorials. That is, till October 1980 in *Kilobaud Microcomputing* ("The Detroit Syndrome," p. 6).

I am a tool and die maker and a UAW (United Auto Worker) member. I subscribe to three of your magazines—73, *Kilobaud Microcomputing* and 80 *Microcomputing*. I make my living as an overpaid auto worker, and I buy an overpriced magazine. I work hard and with good productivity. My company (J. I. Case) makes a good profit.

Robert L. Kennedy K9DXB
Merom, IN

BPS SOFTWARE

FOR OHIO SCIENTIFIC USERS

BPSORT for DMS

- **MACHINE CODE** for high-speed sorting
- **BASIC** language program for establishing sort parameters
- Files of any length can be sorted
- Floppies and hard disks are supported
- Up to five keys can be specified
- Ascending and descending keys are processed simultaneously
- "Header" records can be skipped if present
- Requires **OS-65U**

BPSORT \$124.00

EASY TO USE AND EXTREMELY FAST. A FILE OF **TWENTY-THOUSAND** BYTES CAN BE SORTED IN **LESS THAN 10 SECONDS**.

Order C.O.D. Master Charge or Visa from 168

Honders Inc
57 North Street
Middletown, NY 10940
Telephone (914) 343-4880



If you have an Apple, Pet or TRS-80 microcomputer,* you can have fantasy at your fingertips with Epyx computer games from Automated Simulations.

Like me, you're probably really into games, all sorts of games. But an Epyx game is more than a game — it's an experience, and it's a chance to use your computer for something other than work. The great thing about Epyx games is that you have a choice. Whether you're a beginner or an expert, you can find games that are easy to learn. Challenging. Fun to play for twenty minutes or

**"I can rescue ten prisoners
slay a mad wizard, retrieve
stolen treasure and save
money. So
can you!"**

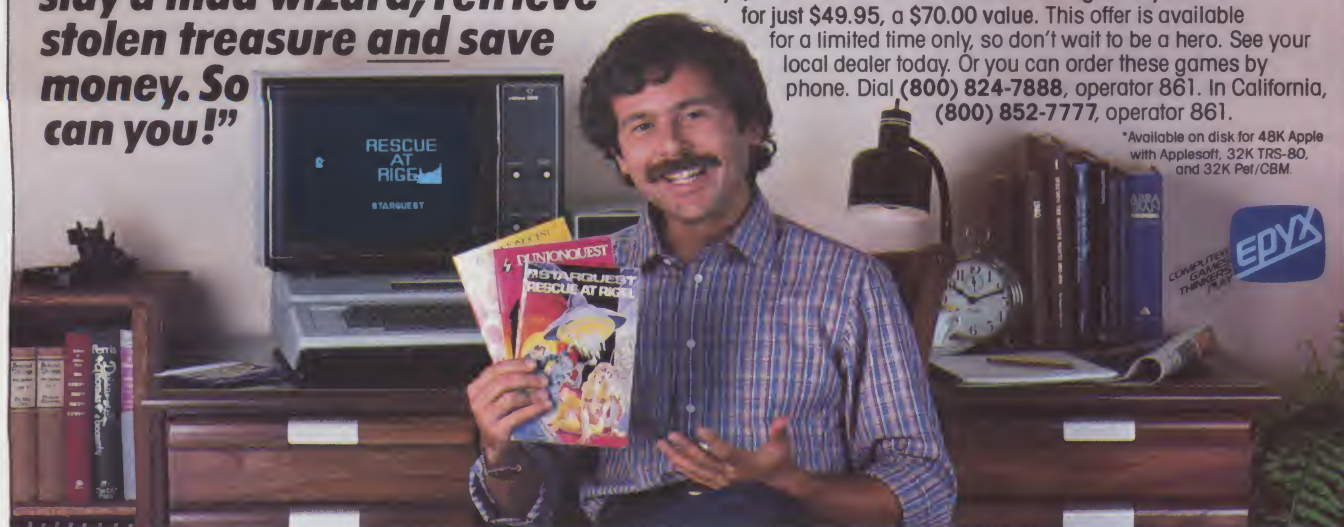
hours at a time. You can play these games over and over, because you're constantly trying new tactics and strategies.

I've already entered and re-entered a world of monsters and misfits, demons and dwarves, trials, tribulations and treasures with a game called "Temple of Apshai." Now it's my chance to have fun with three more games from Automated Simulations... and I can save money, too!

With "Datestones of Ryn" and "Morloc's Tower," I get to escape from booby-trapped mazes, find more treasures and zap more monsters. And with "Rescue at Rigel," I get to outwit the nasty High Tollah and free 10 prisoners.

Automated Simulations has a special offer on "Datestones of Ryn," "Morloc's Tower" and "Rescue at Rigel." Buy all three for just \$49.95, a \$70.00 value. This offer is available for a limited time only, so don't wait to be a hero. See your local dealer today. Or you can order these games by phone. Dial (800) 824-7888, operator 861. In California, (800) 852-7777, operator 861.

*Available on disk for 48K Apple with Applesoft, 32K TRS-80, and 32K Pet/CBM.



Bill Blue Moves On

The founder of ABBS starts a message system for Apple owners

In this article, we will visit with one of the major contributors to the microcomputer side of the data communications industry, Bill Blue. We will also look at the Lynx, one new modem system for the TRS-80 and Apple.

Mr. ABBS?

Bill Blue has been referred to in this column and in other places as the father of the Apple Bulletin Board electronic message and program transfer system. There are, by far, more ABBSes operating than any other type of system. But surprisingly, Bill opened this interview by asking to be dropped from the ABBS family tree.

Blue: "It's true that I was heavily involved in the original development of the ABBS software, but I haven't had anything to do with it for over a year. The very first software in skeleton form was written by Craig Vaughn (now with Source Telecomputing Corporation). I took this basic structure and added my own ideas and features. The software was distributed through Peripherals Unlimited, which was Craig's company at the time. He and I worked together on version 3.0, but I haven't had anything to do with the ABBS software since about June 1979."

Microcomputing: "Then what are you doing now?"

Blue: "I have several projects going. All still relate to the Apple computer. My long-term labor of love is the People's Message System. The PMS is totally my concept of what is capable of being done on an Apple system, and I am very proud of the way it has turned out. I originally wrote it just for myself, but recently decided to make it available for others. There are now six PMSes on line and more on the way. Those on line in California include my own in Santee, plus San Diego, Anaheim, Los Angeles and Palo Alto. There is also one on the Gulf Coast at Freeport, TX."

Microcomputing: "What are some of the features of the PMS that make it special? What is the philosophy guiding the features you put in?"

Blue: "I've tried to make the PMS much more than just a message system. I try to be innovative and provide ideas that are new to the field, but still keep the system bullet-proof and easy to operate. This gets tough because the more features you put in the more complex the software becomes.

"For example, I got very tired of having to scan messages and then type in all the message numbers that I wanted to read, so I came up with flagging. The People's Message System was the first to incorporate that feature. All you have to do is type the letter R when you see a message you would like to read later. After you have marked all the messages you want to read, you type an asterisk and they come back in chronological order.

"To get away from the message-only kind of system, I added program downloading—also the first of its kind in the country."

Microcomputing: "Downloading is the ability to transfer programs from the message system to a calling user's Apple?"

Blue: "Yes. And then came program uploading—from the users to the system. I thought it would be a terrific way to exchange programs. Unfortunately, I quickly learned that people were very eager to spend much time in taking programs from the system, but they were very slow to contribute anything. That situation has improved recently, and all the programs I offer on the download section have been contributed by users of the system.

"Lately, on my system in Santee, I

have been concentrating more on the "features" section. These range from articles of general interest to editorials contributed by users. The Anaheim PMS is concentrating on the video field, and the Palo Alto PMS is centering around Apple-related articles."

Microcomputing: "That's quite a project. It sounds like you are becoming an electronic publisher. What else has been keeping you busy?"

Blue: "My second big project is the ASCII Express. The Express is a communications program for the Apple that turns it into a smart terminal for data communications operations."

Microcomputing: "We reviewed the program in the July 1980 issue."

Blue: "Yes, and I am still getting orders from that initial review! But now I have a much-updated version I call ASCII Express II. It fully supports upper and lowercase and allows conversational copy as well as a formal file transmission capability. I have included a line editor that can be used to make up messages off line and it has fully programmable keyboard MACROS for very fast semiautomatic log in and command execution."

Microcomputing: "What does it sell for and what kind of equipment do you need to use it?"

Blue: "I thought you'd never ask! It sells for \$59.95 and is marketed by Southwestern Data Systems. It is a disk-based program, so you have to have an Apple II with at least one disk drive. You need either Applesoft in ROM or the language card. It works well with the D. C. Hayes modem board, but it can also be

People's Message Systems

Anaheim, CA	714-772-8864	
Freeport, TX	713-223-7943	
Los Angeles, CA	213-291-9314	(Evenings and weekends only)
Palo Alto, CA	415-492-7691	
San Diego, CA	714-582-9557	(Evenings and weekends only)
Santee, CA	714-449-5689	



META TECHNOLOGIES

FOR YOUR DISK SYSTEM



FILE BOX

DISKETTE STORAGE SYSTEM



\$24⁹⁵ for 5 1/4" disks
for 8" disks . . . \$29.95

MTC brings you the ULTIMATE diskette storage system, at an affordable price. Storing 50 to 60 diskettes, this durable, smoke-colored acrylic unit provides easy access through the use of index dividers and adjustable tabs. Unique lid design provides dust-free protection and doubles as a carrying handle.

PLASTIC LIBRARY CASES (not shown)

An economical form of storage for 10 to 15 diskettes, and is suitable for your bookshelf! Case opens into a vertical holder for easy access.

5 1/4-inch diskette case \$3.25
8-inch diskette case \$3.50

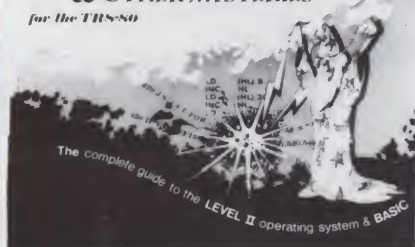
TRS-80™ PRODUCTS

James Farrow

MICROSOFT BASIC DECODED

& OTHER MYSTERIES

for the TRS-80



NEWDOS/80 by Apparat \$149.95
NEWDOS+ with ALL UTILITIES
35-track \$69.95
40-track \$79.95
TRS-80™ DISK
AND OTHER MYSTERIES \$19.95
MICROSOFT™ BASIC DECODED & OTHER
MYSTERIES for the TRS-80™ \$29.95

'RINGS' & THINGS

Help prevent data loss and media damage due to improper diskette centering and rotation with the FLOPPY SAVER™ reinforcing hub ring kit. 7-mil mylar rings install in seconds. Kit is complete with centering tool, pressure ring, 25 adhesive backed hub rings and instructions.

HUB RING KIT for 5 1/4" diskettes . . \$9.95
REFILLS (50 Hub Rings) \$4.95

Protect your expensive disk drives and your valuable diskettes with our diskette drive head cleaning kit. The kit, consisting of a pair of special "diskettes", cleaning solution and instructions, can be used for 52 cleanings. Removes contamination from recording surfaces in seconds without harming drives.

CLEANING KIT for 5 1/4" drives . . . \$24.95

Single Sided, Single Density, Soft-Sector'd
5 1/4-inch, (for TRS-80™) Mini-floppy

DISKETTES

\$21⁹⁵ box of 10

These are factory fresh, absolutely first quality (no seconds!) mini-floppies. They are complete with envelopes, labels and write-protect tabs in a shrink-wrapped box.

PLAIN JANE™ DISKETTES

The Beautiful Floppy
with the Magnetic Personality™

Thousands of people have switched to this low-cost alternative. These quality diskettes are packaged in a plain white box . . . no fancy printing, fancy names or fancy labels, not even our own (labels cost money). Trust us.

PLAIN JANE™ Diskettes \$21.95
10 boxes of 10 (each box) \$21.50

VERBATIM'S PREMIUM DISKETTES AT
AFFORDABLE PRICES

DATALIFE™

Seven data-shielding improvements mean greater durability and longer data life. These individually certified diskettes feature thicker oxide coating, longer-lasting lubricant, improved liner, superior polishing and more! Meets or exceeds IBM, Shugart, ANSI, ECMA and ISO standards. Buy the best . . . buy DATALIFE™.

VERBATIM DATALIFE™ DISKETTES

5 1/4-inch (box of 10)
MD525-01 \$26.95
10 boxes of 10 (each box) \$25.95
8-inch FLOPPIES
Single-Density, FD34-1000 . . \$29.95
Double-Density, FD34-8000 . . \$39.95

CALL FOR INFORMATION ON
OTHER TRS-80™ PRODUCTS

Products damaged in transit will be exchanged. Prices, Specifications, and Offerings subject to change without notice.

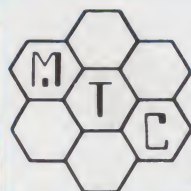
**MOST ORDERS
SHIPPED
WITHIN ONE
BUSINESS DAY**

PRICES IN EFFECT
March 1, 1981 THRU
March 31, 1981

WE ACCEPT

- VISA
- MASTER CHARGE
- CHECKS
- MONEY ORDERS
- C.O.D.

- Add \$2.50 for standard UPS shipping & handling
- \$2.00 EXTRA for C.O.D.
- Ohio residents add 5 1/2 % sales tax.



FOR PRODUCT INFO
1-800-321-3640

CALL
TOLL
FREE

TO PLACE ORDER
1-800-321-3552

IN OHIO call (216)289-7500 (COLLECT)

META TECHNOLOGIES CORPORATION

26111 Brush Avenue, Euclid, Ohio 44132



810115

TRS-80 is a TM of Tandy Corp.
PLAIN JANE is a TM of MTC.
©1981 by Metatechnologies Corporation, Inc.



The Lynx modem by EMTRON Systems provides full-originate and answer capability for the TRS-80 model I.

used with a communications card and standard modem."

Microcomputing: "But that's a finished product. What's next?"

Blue: "Well, the ASCII Express and the People's Message System will never be stagnant. I'm going to keep improving both of them. But for the future, I will soon have a similar terminal package available for the CP/M Apple with the Z-80 softcard. It is called Z-Term and will also be available through Southwestern Data Systems. In addition, I am working on another program I call Online. This is a private message system for those who want to limit access to only authorized users. It will have message upload and download, user account codes, private mail and editing functions."

Microcomputing: "Any words on the outlook for the future of data communications systems?"

Blue: "I'm sure it is obvious to most who have been following your articles or have been participating in this area that

we are still just at the starting point of what could be one of the most significant changes in communications since radio and television. This form of communications has been around for years, but only among those "elite few" who were in some way involved with a large company or government computer network. The microcomputer has made this communications form open to everyone. As more persons become computer-literate it will be possible for country-wide communications via computer to be an everyday occurrence in a typical household. I think it's just great and I am thrilled to be a part of it."

(Bill's software products are available from Southwestern Data Systems, PO Box 582, Santee, CA 92071.

The Lynx

I first mentioned the Lynx in the December 1980 Dial-Up Directory (p. 202). The Lynx is a modem for the TRS-80 Level I which does not need the expansion interface to operate. I have used the equipment now for several months and I am impressed with it. At a trade show in December, a Lynx for the Apple II was demonstrated. I don't have any further details right now, but the following description of the TRS-80 Lynx should apply pretty well to the Apple version.

The Lynx plugs directly into the TRS-80 keyboard or the expansion interface. The installation takes about 30 seconds and is well-illustrated in the instruction manual. The Lynx fits nicely under a desk-style telephone and is color-coordinated with the TRS-80.

The modem is well-built, on one high-quality circuit board. The power supply is a typical line cord transformer. Originate and answer modes of operations and the default values of the word length and parity are selected by switches on the back panel. The large Data-Talk switch on the front panel is easy to use, but I would like to see some warning indicator, perhaps an LED or a physical color change, when it is in the data position. Several times family members have tried to use the phone hooked to the Lynx and

found it dead because I hadn't flipped back to talk.

The Lynx is a complete system. It comes with its own terminal emulation (EMTERM) software on cassette for either the TRS-80 Level I or II. Even a very bare-bones Level I system can prepare messages off line, store them for future transmission, and act as a terminal with the ability to send control codes and escape. The Lynx EMTERM program also allows changes to be made to the parity, word length and number of stop bits from the keyboard.

The Store Message command establishes a 1024-character buffer in RAM for writing a message. There is no line editing. Once you get on line with the system or TRS-80 you are exchanging data with, the shift right arrow command will send the message contained in the buffer out the Lynx port. The message buffer is not erased, so the message can be transmitted again to other systems.

The Terminal mode is the normal mode of operation. This dumb terminal emulator provides all the capability you need for operation with all electronic message systems and information utilities. It isn't fancy, but it works! If you have a printer with a parallel interface, it can print received data as it comes in. This is the next best thing to having a disk-based smart terminal saving the data in files. The terminal software includes a command for toggling the printer on and off.

The TRS-80 Level II program adds two more features, which let you transmit and receive BASIC programs. The transmission feature will allow loading a program into RAM from cassette. The program can be transmitted as soon as the receiving station is ready. If you receive a program using the BASIC Receive option, you can then run, list or CSAVE it.

Documentation for the Lynx is like the software—simple but adequate. The eight-page manual tells you what you need to know to operate the system, but not much more. No schematic diagrams or program listings are provided.

The Lynx hardware will also operate with any other software package designed for the standard TRS-80 communications configuration. The Lynx will not work on a TRS-80 that has the standard RS-232 board in place. The inclusion of the practical EMTERM program in the \$235 Lynx package makes it a good value. You can easily put a Lynx/TRS-80 Level I terminal on line for under \$700. It would be difficult for any commercial supplier to match its performance at that price.

If you have any data communications comments or questions, send them to me at PO Box 691, Herndon, VA 22070. Include a stamped envelope if you want a reply. Electronic mail is welcome at TCB967 on The Source, 70003.455 on CompuServe or the AMRAD CBBS (703-734-1387). □

MICRO QUIZ

What Does This Program Do?

When statement 110 is reached, what is the value of V?

```

10 DIM X(20)
20 DATA 6,4,9,2,5,1,8
30 READ N
40 FOR I = 1 TO N
50 READ X(I)
60 NEXT I
70 V = X(1)
80 FOR J = 2 TO N
90 IF X(J) > V THEN V = X(J)
100 NEXT J
110 PRINT V
120 END

```

(answer on page 150)

4 ALL NEW GUIDES

from OSBORNE/McGraw-Hill

149

The Apple II User's Guide by Lon Poole, Martin McNiff, and Steven Cook #46-2, \$15. ☐

This Guide is the key to unlocking the full power of your Apple II or Apple II plus computer. The Apple II User's Guide brings together in one place a wealth of information for Apple computer users. It will tell you more about your Apple than any other single source. This book will save you both time and effort. No longer will you have to search endlessly for useful information. It's all here, in the Apple II User's Guide, thoughtfully organized and easy to use. Topics include:

*Applesoft and Integer BASIC programming - especially how to make the best use of Apple's sound, color and graphics capabilities. The book presents a thorough description of every BASIC statement, command and function.

*Advanced programming - special sections describe High Resolution graphics techniques and other advanced applications.

*Hardware features - the disk drive and printer are covered in separate chapters.

*Machine level programming - although not a machine language programming guide, this book covers the Machine Language Monitor in detail.

*Apple is a trademark of the Apple Computer Corporation.

PET/CBM Personal Computer Guide Second Edition by Adam Osborne and Carroll Donahue #55-1, \$15. ☐

The PET/CBM Personal Computer Guide is a step-by-step guide that assumes no prior knowledge of computers. If you can read English, you can use this book. This revised second edition provides even more useful material than the popular first edition. It covers the most recent CBM products: the CBM 8000 and 4000 series computers, the 2040 and 8050 disk drives, and programmable printers. Adam Osborne co-authored this new edition. He has re-written it to be a step-by-step BASIC tutorial. So if you don't know BASIC, don't worry. This book will teach you both BASIC and CBM BASIC. If you're thinking about buying any personal computer, this book will show you what the PET can do for you. If you've just bought a PET or CBM, this is the book you must have to really understand your computer. By using the examples found in this book you'll quickly get your PET/CBM up and running. These examples are thoroughly documented so you can learn how and why the programs work. It's the "how" and "why" that are important in learning to make the PET work efficiently for you. The PET Personal Computer Guide covers everything you'll need to be master of your PET.

*PET and CBM are both trademarks of Commodore Business Machines.

CP/M User's Guide by Thom Hogan #44-6 \$12.99 ☐

If you haven't yet purchased CP/M for your system, the CP/M User's Guide will make your first use of CP/M easy. If you already have CP/M, this book will help you modify your system and let you "jockey your disks" like an expert. The CP/M User's Guide describes all types of CP/M and their compatibility. It includes a discussion of conventions used to create file names and command lines. Numerous sample screen displays for every version of CP/M graphically explain every operator command and computer response. CP/M's Assembly Language Utilities are described for the non-technical reader who wants maximum use of CP/M's capabilities. The book also discusses how application packages, high level languages, solution programs, and other support programs combine with CP/M to answer a user's individual needs. You'll also find an explanation of MP/M and CP/NET as well as the technical aspects of CP/M's internal structure which will permit you to make simple modifications. A full glossary and several useful appendices are included.

*CP/M is a trademark of Digital Research Corporation.

The Business System Buyer's Guide by Adam Osborne #47-0 \$7.95 ☐

This is no ordinary computer buying guide. For starters it's an Osborne/McGraw-Hill book, which means it's both insightful and reliable. Secondly, it was written by Adam Osborne. Dr. Osborne is the foremost authority on the use of microcomputers in business. This book takes you by the hand and guides you through the complex process of buying a small computer. Using case histories (in which names have been changed to protect the guilty), Dr. Osborne steers you clear of the mistakes others have made. You'll get more from this book than a list of hardware; you'll get solid information on how to go about buying a computer for business, what to look for, and most important, what questions to ask. Really knowing how to go about buying a business computer will save you time, pain, and lots of money. Before you buy or even before you speak to another salesman, buy this book. You'll never make a better investment.

Make check payable to: OSBORNE/McGraw-Hill

630 Bancroft Way, Berkeley, CA 94710 Dept. K8 Phone Orders: (415) 548-2805



Name

Address

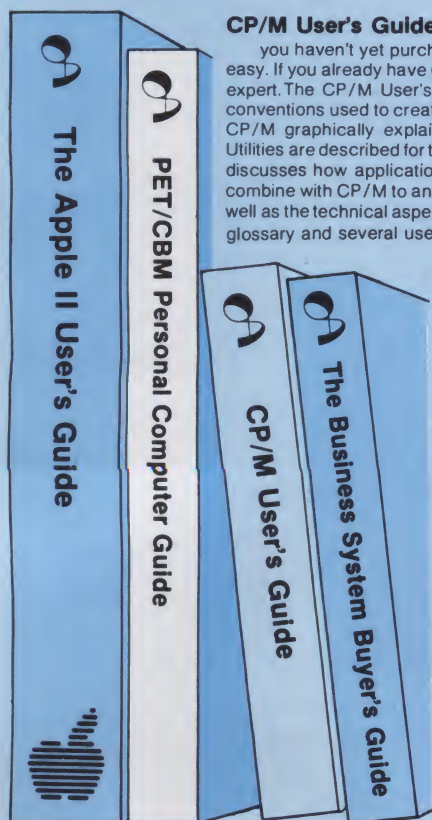
City/State/Zip

Plus ☐.75/item 4th class ☐\$1.25/item UPS ☐\$2.50/item Air Mail ☐\$4.00/item Overseas (California residents add applicable tax.) ☐ Please send me your free catalog.

Total amount enclosed \$ or charge my ☐Visa ☐Mastercharge

Card # Expiration Date

Signature



Humanitarian Computerists

Over 800 micro users form a network to help refugees

Micros Reuniting Families

An international microcomputer network is helping to reunite Vietnamese families that were separated after emigrating from Indochina.

Family Reunification Services, based in Calgary, Alberta, Canada, includes some 800 microcomputerists in 23 countries. The service, in operation since August 1980, has brought together members of almost 200 families.

The way the service works, each micro user gathers from local humanitarian groups the names of Vietnamese who have resettled in his area and are looking for relatives. He sends the list on tape to the next computerist, who checks it against his list. He adds the names from his area, and mails the cassette to the next station.

If a computerist finds a match, he sends the information to Calgary, and the two parties are notified.

Locating the family members is only the first step. Getting them together is another matter, says FRS President J. E. Caruana, and can be a complicated process.

"Here we get into dollars and cents," Caruana says. "Where do they get the money to travel?"

"Also, a person who has resettled is no longer a refugee, and we get into legal and immigration problems. If one family member has to move to another country, does that country have quotas? And what constitutes a family? Is a son through marriage a family member?"

Families sometimes have to relocate over great distances or from one country to another. One family, Caruana says, had to move from Houston, TX, to Montreal, Canada.

Caruana became involved in the refugee movement in 1978. He has since quit his job, and with the financial backing of some local businessmen, runs the FRS full-time. "I work 56 hours a day, 18 days a week, 38 months a year," he says.

The project, he says, will probably go

on for another couple of years. "Maybe then we can call the whole thing to a halt and say, 'Hey, we've really accomplished something,'" he says.

What will happen to the network? Caruana, the owner of a TRS-80, hopes to maintain it as a sort of users group that will swap information and ideas on microcomputing in general.

Caruana says that several governments have expressed an interest in the concept of FRS.

"Suppose there were another earthquake in Italy, or an upheaval in Chile," he says. "Something like this could become very useful." But at the moment, Caruana is only interested in reuniting Vietnamese families. "I believe in the cause," he says.

Any microcomputerist, regardless of what kind of system he has, is invited to join the network. For more information, write the FRS, 7203 Huntercrest Road N.W., Calgary, Alberta, Canada T2K 4J9.

Source Offers Job Listings

The Source and Computer Search International are now offering a listing of job opportunities and resumes through The Source's information network.

The CSI "Career Network" is supported by a membership of executive recruit-

ing firms in major cities in the United States, England and Australia. Descriptions of corporate job opportunities and individual resumes are listed. Individuals and corporations can sort through the job market data with reference to salary range, geographic location, job experience, education and special skills. The service includes 40 job categories, displaying the several that apply to any applicant or corporation.

All information listed on the Career Network is confidential. Resumes and job openings are key-coded to the CSI Career Network member recruiting firm that holds the listing. Follow-ups are made directly to the member firm or directly to Computer Search International, in Baltimore.

Peripheral Sales to Soar?

Sales of mini and microcomputer peripherals will increase by 400 percent over the next ten years, claims a recent report from International Resource Development, Inc.

In addition, the IRD report forecasts that:

● Floppy disk drives, Winchester drives and other mass storage devices will remain the single largest segment of the market.

Peripheral Category	1980	1982	1985	1990
Data Entry Equipment	240	370	915	1,730
Printers	560	780	1,010	1,185
Memory	300	750	1,150	1,650
Disk/Tape	1,000	1,850	2,565	2,670
G P Terminals	650	1,100	1,650	3,450
Datacomm Equipment	370	665	925	1,915
Sub-total	3,120	5,515	8,215	12,600
Integral Peripherals	240	260	2,115	17,400
Totals	3,360	5,775	10,330	30,000

Mini/micro peripheral shipments for 1980-1990. (Source: International Resource Development, Inc.)

- Total printer shipments for mini/micro systems will jump from \$500 million in 1980 to \$1 billion in 1990. Half of those printers will be nonimpact.

- More and more microcomputer products will have built-in telecommunications abilities and will be used to access a variety of new information services and data bases.

- While there is now about one terminal for each 20 white collar desks, the proportion will be one in three by the end of the decade.

- More than half of the 100+ firms now making mini/micro peripherals will disappear.

- Xerox, which owns Shugart and Diablo, could become the leading supplier of mini/micro peripherals in the 80s.

For more information on the report, contact IRD at 30 High St., Norwalk, CT 06851 (Tel. 203-866-6914, Telex 64 3452).

School Pushes Telecom

Golden Gate University in San Francisco is going into telecommunications in a big way. The school has established two new undergraduate programs in telecommunications management and has appointed four telecommunications professionals to the faculty.

Students will be offered a B.S. in telecommunications management, as well as graduate and undergraduate certification in telecommunications management if they don't want the degree.

Courses include Introduction to Telecommunications Management, Corporate Telecommunications, Survey of Data Communications Systems, Networks and Switching Systems, Legal and Regulatory Aspects of Telecommunications, Telecommunications Technology and Society, Teleconferencing and Satellite Systems, and Viewdata and On-line Commercial Information Systems.

For information, write GGU, 536 Mission St., San Francisco, CA 94105.

TV Station Uses Computer for Elections

WOWK-TV in Huntington, WV, used a small business computer to tabulate election returns during the Presidential elections in November.

Returns were phoned in to WOWK by League of Women volunteers from precincts in the West Virginia-Ohio-Kentucky triangle. Station personnel then keyed the figures into a Pertec PCC 2000 system. Four terminals computed the returns, while a fifth broadcast the results to home viewers.

The old method is to tabulate returns manually. Incoming results are flashed in handwritten numbers, which are then entered into the video equipment. The

PCC 2000 provided more accuracy, and also let viewers watch the results change on the terminal.

Vroom Vroom

The computerized motorcycle has arrived.

The Yamaha SECA 750 uses a microcomputer to monitor the sidestand, the brake fluid level, the battery fluid level, the fuel level, the engine oil level, the headlight, the taillight and the stoplight.

The system consists of the micro, an integrated circuit board, a liquid crystal diode and sensors for the key functional areas being monitored.

When the driver turns on the ignition, the handlebar-mounted computer first reports its condition before beginning to analyze the sensed areas two seconds later. When the monitored function is in working order, there is a brief burst of light on the LCD confirming this. But, if a problem—however minor—arises in any of the functions subject to the computer's scrutiny, the LCD remains lit.

Suggested retail price is expected to be less than \$3500.

Videotex '81

Videotex '81, the first major conference and exhibition on videotext in North America, is set for May 20-22 in Toronto, Ontario.

The conference program will run in three parallel streams. The first will cov-

er current videotext developments around the world, and will include reports from the UK, France, Germany, Japan, Canada and the US. The other two will be for executives looking for new and more effective corporate information systems and for businessmen looking for opportunities as entrepreneurs, information providers and equipment suppliers.

Conference topics will include advertising through videotext, teleshopping and direct marketing, electronic mail, electronic funds transfer, education, entertainment, database publishing, impact on newspapers, private videotext systems, syndicated user groups, interactive cable TV, teletext, intelligent terminals and personal computers, regulatory and legal issues, market development projections and the social impact of new technology.

For more information, contact Pam Carter, Videotex '81, Infomart, 122 St. Patrick St., Toronto, Ontario M5T 2X8, Canada (Tel. 416-598-1981, Telex 0622111).

Quote of the Month

"We might stop having printed magazines, and everything might appear on a screen someplace, but I don't think that that's any less a magazine. If people prefer to read it sitting in front of a screen, fine, we'll create such an editorial product."

—Edward Thompson, Editor in Chief of *Reader's Digest*, which recently bought *The Source* information network; quoted in *Next* magazine.

The Yamaha SECA 750, the world's first computerized motorcycle. The computer console is shown in the inset.



MORE FOR YOUR RADIO SHACK TRS-80 MODEL I !

- ★ **MORE SPEED**
10-20 times faster than Level II BASIC.
- ★ **MORE ROOM**
Compiled code plus VIRTUAL MEMORY makes your RAM act larger.
- ★ **MORE INSTRUCTIONS**
Add YOUR commands to its large instruction set!
Far more complete than most Forths: single & double precision, arrays, string-handling, more.
- ★ **MORE EASE**
Excellent full-screen Editor, structured & modular programming
Optimized for your TRS-80 with keyboard repeats, upper/lower case display driver, single- & double-width graphics, etc.
- ★ **MORE POWER**
Forth operating system
Interpreter AND compiler
Internal 8080 Assembler
(Z80 Assembler also available)
VIRTUAL I/O for video and printer, disk and tape
(10-Megabyte hard disk available)

MMSFORTH

THE PROFESSIONAL FORTH FOR TRS-80 MODEL I

(Over 1,000 systems in use)

MMSFORTH Disk System V1.9 (requires 1 disk drive & 16K RAM) just \$79.95*
MMSFORTH Cassette System V1.8 (requires Level II BASIC & 16K RAM) \$59.95*

AND MMS GIVES IT PROFESSIONAL SUPPORT

Source code provided
MMSFORTH Newsletter
Many demo programs aboard
MMSFORTH User Groups
Programming staff can provide advice, modifications and custom programs, to fit YOUR needs.

MMSFORTH UTILITIES DISKETTE: Includes FLOATING POINT MATH (L2 BASIC ROM routines plus Complex numbers, Rectangular-Polar coordinate conversions, Degrees mode, more), plus a full Forth-style Z80 ASSEMBLER; plus a powerful CROSS-REFERENCER to list Forth words by block and line. All on one diskette (requires MMSFORTH, 1 drive & 16K RAM). . . \$39.95*

THE DATAHANDLER V1.1, a very sophisticated database management system operable by non-programmers (requires Disk MMSFORTH, 1 drive & 32K RAM); with manuals. \$59.95*

FORTH BOOKS AVAILABLE

MICROFORTH PRIMER (comes with MMSFORTH) separately \$15.00*
USING FORTH — more detailed and advanced than above \$25.00*
THREADED INTERPRETIVE LANGUAGES—advanced, excellent analysis of MMSFORTH-like language \$18.95*
CALTECH FORTH MANUAL — good on Forth internal structure, etc \$10.00*

* — Software prices include manuals and require signing of a single-system user license. Add \$2.00 S/H plus \$1.00 per additional book; Mass. orders add 5% tax. Foreign orders add 15%. UPS COD, VISA & M/C accepted; no unpaid purchase orders, please.

Send SASE for free MMSFORTH information.
Good dealers sought.

Get MMSFORTH products from your computer dealer or

**MILLER MICROCOMPUTER
SERVICES(K3)** ✓255

61 Lake Shore Road, Natick, MA 01760
(617) 653-6136

AS THE WORD TURNS

By Eric Maloney

Etymological Gymnastics

Several years ago, the newspapers covered a number of dramatic stories about parents hiring kidnappers to rescue their children from unorthodox religious groups. These kidnappers would take the children into a motel room for several days and nights in an attempt to "deprogram" them.

Nobody gave the word "deprogram" much thought at the time. But it is a prime example of how the computer world can borrow a word, change the meaning and reintroduce it into everyday language.

The original meaning of the verb "program" is, according to the *Oxford English Dictionary*, "To arrange by or according to a program; to draw up a program of; to scheme or plan definitely." They illustrate with an example from the sports world: "This match was programmed to start yesterday."

When computerists took the word for their own use, they modified and narrowed its definition. "Program" came to mean the act of preparing a set of instructions telling a computer what to do. A program, says Charles J. Sippl's *Microcomputer Dictionary and Guide*, includes "plans for the transcription of data, coding for the computer and plans for the absorption of the results into the program."

Eventually, computers caught the attention of the general public, and people became familiar with the concept of programming. It was only a matter of time before the idea was applied to humans, as a synonym for indoctrination or brainwashing.

(It is interesting that programming, in itself a neutral act, has come to indicate a cold, inhuman, ultimately destructive process. This says something about how people perceive computers. I'll deal with this in a later column.)

Several other computer words are working their way into the common language. "Interface" is an example.

The *OED*, published in 1935, defines an interface as "a surface lying between

two portions of matter or space." Scientists extended that meaning to include, according to the 1976 *OED* supplement, "An apparatus designed to connect two scientific instruments, devices, etc., so that they can be operated jointly."

Finally, the social scientists applied it to the field of human experience, using the word to indicate "A means or place of interaction between two systems, organizations, etc.; a meeting-point or common ground between two parties, systems or disciplines; also, interaction, liaison, dialogue."

"Interface" has since become a buzzword meaning "to talk." It is interchangeable with "rap," "relate" or "interact." For example: "Why don't we go to lunch, and interface?"

"Peripheral" is another one. Originally an adjective, it means "Of, pertaining to, or situated in, the periphery . . . of the surface or outward part of an organic body, especially in peripheral neuritis, inflammation of one or more nerves of both sides." Computerists made it a noun, meaning any device that works with a computer but is not a part of it.

This word isn't used as much as "program" or "interface," but it's only a matter of time. I predict that within ten years, we'll be buying peripherals for our blenders, outdoor barbecue sets, trash compactors, and probably even our wristwatches.

What's next? "Modem" has a good chance of making it into our everyday language, as soon as enough businessmen start using them. Other possibilities include "debug," "buffer" and "software."

Then there are all the possible new idiomatic expressions. Someone not in the mainstream of office activities is "out of the loop." A person no longer in complete control of his senses is characterized as having "blown a disk."

If you've heard any interesting new expressions using computer terminology, drop me a line. I'll put them in my buffer for a future column. □

KILL SURGES LIKE LIGHTNING!

AC power line surges are destructive, can cost you money, and can't be prevented. But you can stop them from reaching your sensitive electronic equipment with a Surge Sentry.

Surge Sentry acts in picoseconds to dissipate up to a 1,000,000 W, 100 μ second surge. Triggers at 10% above nominal peak voltage. Works in parallel with the power line. Is easy to install for immediate protection. No complicated wiring or special tools required.

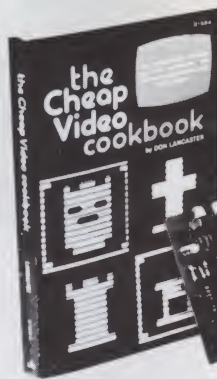
Several different models to choose from, including an OEM version. Call or write today for a free brochure.



RKS ENTERPRISES, INC. ✓ 46

643 South 6th Street, San Jose, CA 95112
(408) 288-5565

DEALER INQUIRIES INVITED



the **ULTIMATE** in
CHEAP VIDEO

**BOOK & KIT
ONLY \$42.95**

Don Lancaster's "Cheap Video" concept allows almost unlimited options, including:

- * Scrolling - Full performance cursor.
- * Line/Character formats of 16/32, 24/80, 32/64 or almost anything.
- * Graphics - up to 256 X 256 B&W; 96 X 128 COLOR (requires low-cost option modules)
- * Works with 6502, 6800 and other micros.

SPECIAL OFFER: Buy the Kit (upper case alpha-numeric option included) & get the Book at 1/2 price.

✓ 106 **PAIA** ELECTRONICS, Dept. K-3 1020 W. WILSHIRE BLVD., OKLAHOMA CITY, OK 73116

I'm Sold. PLEASE RUSH..... () SEND FREE CATALOG

() TVT-658 Kit & Cheap Video Cookbook \$42.95

() TVT-658 Kit only (book required for assembly) - \$39.95

name: _____

address: _____

city: _____ state: _____ zip: _____

PAIA ELECTRONICS, Dept. K-3 1020 WILSHIRE BLVD., OKLAHOMA CITY, OK 73116

**computer
case
company**

**comp
case**



CASES NOW AVAILABLE

- AP101 Apple and Single Disk Drive \$109
- AP102 Apple and Double Disk Drive 119
- AP103 Apple, 9 inch Monitor and Double Drive 129
- RS201 TRS-80, Expansion Unit and Double Drive 109
- RS202 TRS-80 Monitor and Accessories 84
- P401 Paper Tiger Printer 99
- P402 Line Printer II-Centronics 730 89
- CC90 Matching Attache Case 75

CASES SOON AVAILABLE

- RS204 Model III Radio Shack
- RS205 Radio Shack Color Computer
- AP104 Apple/// with Disk Drives and Silentype
- AP105 12 inch Monitor and Accessories

computer case company ✓ 320

5650 INDIAN MOUND CT. COLUMBUS, OHIO 43213 (614) 868-9464





The Newest In

Apple Fun

We've taken five of our most popular programs and combined them into one tremendous package full of fun and excitement. This disk-based package now offers you these great games:

Mimic—How good is your memory? Here's a chance to find out! Your Apple will display a sequence of figures on a 3 x 3 grid. You must respond with the exact same sequence, within the time limit.

There are five different, increasingly difficult versions of the game, including one that will keep going indefinitely. Mimic is exciting, fast paced and challenging—fun for all!

Air Flight Simulation—Your mission: Take off and land your aircraft without crashing. You're flying blind—on instruments only.

A full tank of fuel gives you a maximum range of about 50 miles. The computer will constantly display updates of your air speed, compass heading and altitude. Your most important instrument is the Angle of Ascent/Bank Indicator. It tells if the plane is climbing or descending, whether banking into a right or left turn.

After you've acquired a few hours of flying time, you can try flying a course against a map or doing aerobatic maneuvers. Get a little more flight time under your belt, the sky's the limit.

Colormaster—Test your powers of deduction as you try to guess the secret color code in this Mastermind-type game. There are two levels of difficulty, and three options of play to vary your games. Not only can you guess the computer's color code, but it will guess yours! It can also serve as referee in a game between two human opponents. Can you make and break the color code...?

Star Ship Attack—Your mission is to protect our orbiting food station satellites from destruction by an enemy star ship. You must capture, destroy or drive off the attacking ship. If you fail, our planet is doomed...

Trilogy—This contest has its origins in the simple game of tic-tac-toe. The object of the game is to place three of your colors, in a row, into the delta-like, multi-level display. The rows may be horizontal, vertical, diagonal and wrapped around, through the "third dimension". Your Apple will be trying to do the same. You can even have your Apple play against itself!

Minimum system requirements are an Apple II or Apple II Plus computer with 32K of memory and one minidisk drive. Mimic requires Applesoft in ROM, all others run in RAM or ROM Applesoft.

Order No. 0161AD \$19.95

Paddle Fun

This new Apple disk package requires a steady eye and a quick hand at the game paddles! It includes:

Invaders—You must destroy an invading fleet of 55 flying saucers while dodging the carpet of bombs they drop. Your bomb shelters will help you—for a while. Our version of a well known arcade game! Requires Applesoft in ROM.

Howitzer—This is a one or two person game in which you must fire upon another howitzer position. This program is written in HIGH-RESOLUTION graphics using different terrain and wind conditions each round to make this a demanding game. The difficulty level can be altered to suit the ability of the players. Requires Applesoft in ROM.

Space Wars—This program has three parts: (1) Two flying saucers meet in laser combat—for two players, (2) two saucers compete to see which can shoot out the most stars—for two players, and (3) one saucer shoots the stars in order to get a higher rank—for one player only. Requires Applesoft.

Golf—Whether you win or lose, you're bound to have fun on our 18 hole Apple golf course. Choose your club and your direction and hope to avoid the sandtraps. Losing too many strokes in the water hazards? You can always increase your handicap. Get off the tee and onto the green with Apple Golf. Requires Applesoft.

The minimum system requirement for this package is an Apple II or Apple II Plus computer with 32K of memory and one minidisk drive.

Order No. 0163AD \$19.95

Solar Energy For The Home

With the price of fossil fuels rising astronomically, solar space-heating systems are starting to become very attractive. But is solar heat cost-effective for you? This program can answer that question.

Just input this data for your home: location, size, interior details and amount of window space. It will then calculate your current heat loss and the amount of gain from any south facing windows. Then, enter the data for the contemplated solar heating installation. The program will compute the NET heating gain, the cost of conventional fuels vs. solar heat, and the calculated payback period—showing if the investment will save you money.

Solar Energy for the Home: It's a natural for architects, designers, contractors, homeowners... anyone who wants to tap the limitless energy of our sun.

Minimum system requirements are an Apple II or Apple II Plus with one disk drive and 28K of RAM. Includes AppleDOS 3.2.

Order No. 0235AD (disk-based version) \$34.95

Math Fun

The Math Fun package uses the techniques of immediate feedback and positive reinforcement so that students can improve their math skills while playing these games:

Hanging—A little man is walking up the steps to the hangman's noose. But YOU can save him by answering the decimal math problems posed by the computer. Correct answers will move the man down the steps and cheat the hangman.

Spellbinder—You are a magician battling a computerized wizard. In order to cast death clouds, fireballs and other magic spells on him, you must correctly answer problems involving fractions.

Whole Space—Pilot your space craft to attack the enemy planet. Each time you give a correct answer to the whole number problems, you can move your ship or fire. But for every wrong answer, the enemy gets a chance to fire at you.

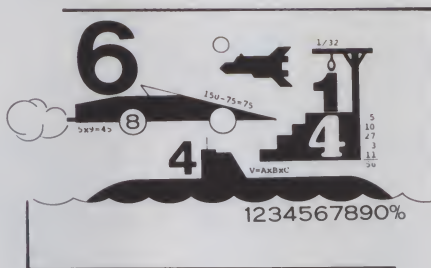
Car Jump—Make your stunt car jump the ramps. Each correct answer will increase the number of buses your car must jump over. These problems involve calculating the areas of different geometric figures.

Robot Duel—Fire your laser at the computer's robot. If you give the correct answer to problems on calculating volumes, your robot can shoot at his opponent. If you give the wrong answer, your shield power will be depleted and the computer's robot can shoot at yours.

Sub Attack—Practice using percentages as you maneuver your sub into the harbor. A correct answer lets you move your sub and fire at the enemy fleet.

All of these programs run in Applesoft BASIC, except Whole Space, which requires Integer BASIC.

Order No. 0160AD \$19.95



Skybombers

Two nations, separated by The Big Green Mountain, are in mortal combat! Because of the terrain, their's is an aerial war—a war of SKYBOMBERS!

In this two-player game, you and your opponent command opposing fleets of fighter-bombers armed with bombs and missiles. Your orders? Fly over the mountain and bomb the enemy blockhouse into dust!

Flying a bombing mission over that innocent looking mountain is no milk run. The opposition's aircraft can fire missiles at you or you may even be destroyed by the bombs as they drop. Desperate pilots may even ram your plane or plunge into your blockhouse, suicidally.

Flight personnel are sometimes forced to parachute from badly damaged aircraft. As they float helplessly to earth, they become targets for enemy missiles.

The greater the damage you deal to your enemy, the higher your score, which is constantly updated at the bottom of the display screen.

The sounds of battle, from exploding bombs to the pathetic screams from wounded parachutists, remind each micro-commander of his bounden duty. Press On, SKYBOMBERS—Press On!

Minimum system requirements: An Apple II or Apple II Plus, with 32K RAM, one disk drive and game paddles.

Order No. 0271AD (disk-based version) \$19.95



*A trademark of Apple Computer Inc.

Instant Software™

PETERBOROUGH, N.H. 03458
603-924-7296

Apple* Software

From Instant Software

Santa Paravia and Fiumaccio

Buon giorno, signore!

Welcome to the province of Santa Paravia. As your steward, I hope you will enjoy your reign here. I feel sure that you will find it, shall we say, profitable.

Perhaps I should acquaint you with our little domain. It is not a wealthy area, signore, but riches and glory are possible for one who is aware of political realities. These realities include your serfs. They constantly request more food from your grain reserves, grain that could be sold instead for gold florins. And should your justice become a trifle harsh, they will flee to other lands.

Yet another concern is the weather. If it is good, so is the harvest. But the rats may eat much of our surplus and we have had years of drought when famine threatened our population.

Certainly, the administration of a growing city-state will require tax revenues. And where better to gather such funds than the local marketplaces and mills? You may find it necessary to increase custom duties or tax the incomes of the merchants and nobles. Whatever you do, there will be far-reaching consequences...and, perhaps, an elevation of your noble title.

Your standing will surely be enhanced by building a new palace or a magnificent *cattedrale*. You will do well to increase your landholdings, if you also equip a few units of soldiers. There is, alas, no small need for soldiery here, for the unscrupulous Baron Peppone may invade you at any time.

To measure your progress, the official cartographer will draw you a *mappa*. From



it, you can see how much land you hold, how much of it is under the plow and how adequate your defenses are. We are unique in that here, the map IS the territory.

I trust that I have been of help, signore. I look forward to the day when I may address you as His Royal Highness, King of Santa Paravia. *Buona fortuna* or, as you say, "Good luck". For the Apple 48K.

Order No. 0174A \$9.95 (cassette version).

Order No. 0229AD \$19.95 (disk version).

TO ORDER

SEE YOUR LOCAL INSTANT SOFTWARE DEALER OR USE THE ORDER FORM BELOW

For Fast Service

call now
Toll

Toll-Free

1-800-258-5473

Apple Cassettes

0018A	Golf.....	\$7.95
0025A	Mimic.....	\$7.95
0040A	Bowling/Trilogy.....	\$7.95
0073A	Math Tutor I.....	\$7.95
0079A	Oil Tycoon.....	\$9.95
0080A	Sahara Warriors.....	\$7.95
0088A	Accounting Assistant.....	\$7.95
0094A	Mortgage w/Prepayment Option/ Financier.....	\$7.95
0096A	Space Wars.....	\$7.95
0098A	Math Tutor II.....	\$7.95
0174A	Santa Paravia and Fiumaccio.....	\$9.95
0148A	Air Flight Simulation.....	\$9.95

We Guarantee It!

Instant Software Guarantee

OUR PROGRAMS ARE GUARANTEED TO BE QUALITY PRODUCTS. IF NOT COMPLETELY SATISFIED YOU MAY RETURN THE PROGRAM WITHIN 60 DAYS. A CREDIT OR REPLACEMENT WILL BE WILLINGLY GIVEN FOR ANY REASON.

Name _____

Address _____

City _____ State _____ Zip _____

☐ Check ☐ Money Order ☐ VISA ☐ AMEX ☐ Master Charge

Card No. _____ Exp. Date _____

Signed _____ Date _____

Order your Instant Software today!

Quantity	Order No	Program name	Unit cost	Total cost
		Shipping and handling		\$1.00

Total order

Instant Software™ Inc.

Peterborough, N.H. 03458

Building the H-89

By Martin Moore

Perhaps you're in the situation where you want a computer, you need a terminal and you need mass storage. But you don't want to pay three separate prices for three separate boxes—that may or may not work together.

Well, that was my predicament. I wanted a system for text processing. I wanted a fairly fast computer, a high-quality terminal with a decent type-writer-style keyboard and a floppy disk. Most of all, I wanted it in one box that wouldn't take up all my desk space. And I wanted it for under \$1500.

I had about given up when in late May of 1979 our friendly postman delivered into my hands a copy of the Heath catalog. And right in the middle was just what I wanted. Heath billed it as the H-89 "all-in-one" computer—a Z-80 controlled terminal, a Z-80-based computer and a 5-1/4 inch floppy drive. All in a small package. Terrific! I ordered one in mid-June of that year. It all came together in mid-October.

Building the Heathkit H-89

What arrived on my doorstep weighed 86 pounds and was distributed among three boxes. The first thing I noticed was that one of the boxes had arrived with its sides bashed in. With some trepidation, I gingerly opened the package to find a 12-inch CRT. Incredibly, the box had been crushed in around the neck of the tube, leaving the glass unscathed.

The smallest box contained a Wangco Model 82 flexible disk drive. The largest box contained the H-89 it-

self. Inside the large box were two smaller boxes and the computer chassis. One of the smaller boxes, the "open me first" box, contained the assembly and operating manuals. The first rule of kit building is to read the assembly manual all the way through—before you begin to build the kit. This little step saves you a lot of headaches. If you want it to work the first time, read the book.

The assembly manual was laid out in Heath's usual excellent fashion. After adding the errata sheets (no one's perfect), I went to work.

Each step of construction is clearly explained, giving detailed information about each phase of assembly. If you've had to contend with other manufacturers' assembly instructions, you'll appreciate Heath. After checking to see that all the parts were there, all I needed was a large work space devoid of small children.

A Foam Cabinet?

The first task is to mount the power transformer on the cabinet base. And yes, Virginia, the cabinet is foam (see Photo 1). Heath chose to save weight by using a structural foam cabinet. Structural foam is curious stuff. It has a hard appearance, but is fairly flexible. It's lightweight, sturdy and easy to work with. You'd be hard-pressed to break it. But bang it with a sharp object, and you'll gouge out material.

Before mounting hardware to the base, brass inserts must be implemented in holes provided. The inserts are placed part way into the holes, then heated to melt their way into the foam as shown in Photo 2.

My initial concerns about strength were alleviated when I found I could tighten screws to my heart's content, without stripping the insert out of the foam.

The cabinet top mounts to the base by way of two hinges at the rear. The hinges allow the cabinet top to be raised or removed entirely for circuit access.

Circuit Boards

When you order the H-89, you get:

- a power supply board,
- a video driver board,
- a Z-80-based terminal logic board (prewired),
- a Z-80 CPU board (prewired),
- a cassette tape interface board (prewired),
- a floppy disk controller board (prewired) and
- the floppy disk drive.

So only two circuit boards had to be built—two circuit boards and what seemed like a whole raft of connector cables. The biggest challenge with this kit was trying to hold #22 wire in a connector and solder it at the same time. I ended up with blisters on my fingertips. I suggest that anyone thinking about buying an H-89 invest in a small vice to hold the connector body while you solder.

The Power Supply

The power supply board is straightforward in construction, requiring

Martin Moore (2735 SW 229, Aloha, OR 97006) contributed the article "The 16-Bit Super Processors Are Here" to our August 1980 issue.

only eight diodes, four filter capacitors and three pin connectors. Make sure you double-check the polarity on the diodes and capacitors. The smell of burning caps is so depressing.

The power transistors mount on a large aluminum heat sink that stands alongside the power supply board. For additional cooling, the fan is mounted on the cabinet top right over the power supply.

Once the supply is built, static tests (power off) are performed to see if any large globs of solder were left on the board. If your job passes the static tests, the moment of truth arrives. You plug it in. Fortunately, mine worked the first time.

The power supply provides +65 V to the video driver board, and +18, -18, +5 and +8.5 V to the rest of the boards. The Wangco disk drive gets +5 and +12 V.

Video Driver Board

The video driver board is next. This board requires about three hours of construction time. Once again, if you follow Heath's instructions, you'll have no trouble. All the part locations are clearly marked on the board, so it's difficult to get a component in the wrong spot.

I did have one bit of trouble. The circuit uses quite a few small glass-encapsulated diodes. Theoretically, the manual gives you the part number, and you examine the diodes for that number. They even give you a magnifying glass so you can see the number. In actual fact, it's nearly impossible to see the number printed on the diode. It seemed like I spent most of my time trying to make out what kind of diode I had. If Heath is open to advice, I'd suggest that they wrap all like diodes together and mark the package. That would certainly save on eye strain. As it was, all the components were in one plastic sack, sort of jumbled together.

Circuitry—The video driver board has its own voltage regulator, which produces a stable +53 and +6 V. The +53 V supply is used to elevate the CRT cathode. The video signals from the terminal logic board, after passing through a cascade amplifier, ride on this +53 V level.

The vertical sync square wave from the terminal logic board is shaped to create a sweep ramp signal that is amplified and placed on the vertical yoke of the CRT. A vertical size adjustment in the amplifier will

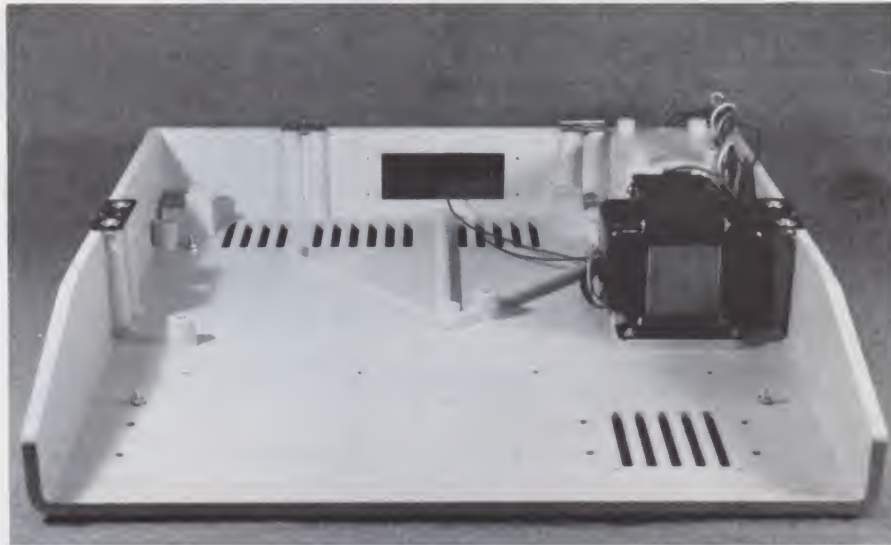


Photo 1. The structural foam base with power supply transformer mounted. The entire H-89 cabinet is made of structural foam.

let you set the vertical height of the display to whatever is comfortable. For me, comfortable was about an inch shorter than the six inches recommended by Heath.

The horizontal sync pulse from the terminal logic board is used to create the +500 V anode voltage for the CRT, as well as control the horizontal deflection of the electron beam.

Placement—The video driver board rests flat in the bottom of the cabinet (Photo 3), mounted to the base by four screws. There's only one problem with this placement, and that occurs later, when you have to slide the cable from the keyboard under the video driver board. It's somewhat difficult to convince the little beggar that it ought to go under there.

Terminal Logic Board

The terminal logic board did not require any work on my part, other than to prepare some more of those countless cables. The terminal logic board is a computer in itself. It has a Z-80 microprocessor, Motorola's 6845 CRT controller, an asynchronous serial port, program ROM, scratchpad RAM and display memory. I'll talk more about the abilities of the terminal later on.

I had one problem with the terminal logic board, and at the time I thought it was my error. The board generates three signals called video, vertical sync and horizontal sync. These three signals are fed to the video driver board (the one I put together).

When I first powered up the H-89, the raster looked horrible. Instead of

white letters on a black background, I was getting white letters on a splotchy gray background. And I could see the retrace zipping across the screen. The problem was fairly obvious—there wasn't enough video signal to create decent contrast. If I backed the brightness down, the characters disappeared. Turn the brightness up, and the screen turned gray.

The oscilloscope told the story. The video driver board was getting nice, fat 5 V signals from the vertical sync and horizontal sync lines, but the video signal was almost nonexistent. Back to the terminal logic board.

Heath uses 74LS86 exclusive-OR devices to drive the video signals. And one of the gates had died. Once I replaced the 74LS86, the display was beautiful—one of the sharpest displays I've seen. Actually, it's a wonder there was any display at all. The



Photo 2. Threaded brass inserts are melted into the foam cabinet. The inserts are used to mount hardware to the cabinet.



Photo 5. The H-89 graphic characters.

keypad lets you do on-screen editing (although none of the Heath software supports this function).^{*} Keys 1 through 9 each have a shifted function that controls the cursor and performs character and line editing jobs. Shifts 4, 8, 6 and 2 move the cursor left, up, right and down, respectively. Shift 3 will delete the cursor line. Shift 7 will let you insert characters, moving all the characters to the right of the cursor to the right of the screen. Shift 9 causes the character at the cursor position to be deleted. And shift 5 homes the cursor to the upper left of the screen.

If you don't want to press the shift key each time you use the cursor controls, the terminal can be placed into a shifted keypad mode by entering ESC t (escape t). This can be done either off-line at the keyboard, or by the computer. This is one of the many escape sequences used to program the keyboard and terminal. ESC t places the keypad into the shifted mode until you tell it otherwise, or shut the H-89 off. Or, if you think you'll want the keypad in the shifted mode most of the time, there's a switch on the terminal logic board that will cause the terminal to power up in the keypad shifted mode. Then you can use ESC u to get out of the shifted mode.

There's a third mode, called the alternate keypad mode, into which the keypad can be programmed. This mode causes the keypad to act much like the programmable keys mentioned before. In the alternate keypad mode, each key sends an unused escape sequence to the computer.

None of these codes are supported in Heath software, but instead rely on a program you write to perform a specific function. This is not to say that Benton Harbor BASIC, Microsoft BASIC or Heath CP/M won't work with these keys. It's just that you have to tell your BASIC program to look out for them. All in all, you get 19 programmable keys with this terminal.

Escape sequences—I mentioned escape sequences in regard to the eight programmable keys and the keypad.

Actually, the whole terminal is controlled with escape sequences, either sent from the computer or entered on the keyboard. The escape sequences do the following:

- ESC p puts the terminal in reverse video mode
- ESC q gets the terminal back out of reverse video
- ESC F puts the terminal in the graphics mode
- ESC G exits the graphics mode
- ESC t places the keypad into its shifted mode
- ESC u exits the shifted mode
- ESC = places the keypad into its alternate mode
- ESC > gets the keypad back to its normal mode
- ESC [puts the terminal into the hold screen mode
- ESC \ exits the hold screen mode

All of the cursor control key actions can be duplicated by the computer with escape sequences. There's an escape sequence for each cursor movement (up, down, backward, forward, home). If the computer sends the terminal an ESC n, the terminal tells the computer where the cursor is with an x-y coordinate. ESC j causes the terminal to save the present location of the cursor, which can be returned to the saved location with an ESC k. And the cursor can be moved directly to a position by entering ESC Y, followed by an x-y coordinate (direct cursor addressing).

All of the editing functions (erase page, erase part of the page, erase a line, insert a line, etc.) can be generated by the computer with an escape sequence.

Escape sequences also let the computer reconfigure the terminal. For example, ESC r lets you set the RS-232C data rate from 110 to 9600 baud. ESC x lets you enable the 25th line, disable the key click, change the cursor from an underline to a block, shut the cursor off and go into any of the shifted or alternate modes. ESC y lets you change everything you set with ESC x. And ESC z resets the whole works to its power-up configuration. It's a very busy terminal!

The one irritating aspect of this

keyboard is that a repeat key is used instead of implementing automatic repeat on each key. If you want multiples of the same character, you have to hold down the repeat key in addition to the character key.

The Screen

The H-89 screen in my machine is of Toshiba origin, and will display 25 lines of 80 characters with true descenders. The screen definition is sharp—you can see each dot in the display's matrix. In fact, trying to blur the screen with the focus control is nearly impossible. I turned the focus control to both stops, and could see very little change in the display. This is a high-quality CRT.

Graphics

The H-89 cannot handle true graphics. Instead, what you get are 33 graphic symbols (see Photo 5). The 33 symbols available are flexible enough to do moderately sophisticated displays, but you simply can't do true, point-to-point graphics work. What's missing is the software in the terminal. I believe the hardware is there, and the screen certainly has enough resolution to handle 2000 point graphics.

But don't despair. I'm sure some enterprising software expert will come up with a ROM package that will let the terminal do its stuff.

The CPU Half

The computer portion of the H-89



Photo 6. The CRT and facade are mounted. The ribbon cable connects to the terminal keyboard.



Photo 7. Nearly complete, the H-89 only requires the 5.25-inch disk drive to be mounted.

is, in all respects, a general-purpose computer. A 2 MHz Z-80 runs the whole affair. The H-89 comes standard with 16K of RAM based at 040,100 (split octal notation). Below this memory space resides the system ROM and the floppy disk ROM and RAM. Heath has reserved 3K of the low memory address space for future use.*

The hardware is already on the board, waiting for another 32K of RAM, which will let you expand to 48K.

There are several I/O ports on the CPU logic board. One port, called the general-purpose port, is for internal use. The general-purpose port tells the computer the state of the configuration DIP switch (baud rate settings, etc.). Another port on the CPU logic board traps on all H8 software instructions that would normally go to the H8 front panel (you can directly run Heath's H8 software on the H-89 without modifications). Since the H-89 doesn't have a front panel, these port accesses are redirected to either do nothing or cause a display on the terminal.

A console port handles serial data transfer to the terminal half of the H-89. And, like the terminal half, the computer uses an 8250 ACE for communications.

The cassette port is actually the place where the cassette interface board plugs in. The cassette port is controlled by firmware in the H-89

system ROM.

The H-89 CPU logic board has room for six accessory circuit boards. Each board plugs into square pins on the CPU logic board. The square pins make up the six parallel I/O ports.

Cassette Tape Interface

When you order the H-89, you get the cassette tape interface with it, whether you want it or not. This seems a little redundant in the face of the floppy disk controller and drive, but that's the way it is.

The cassette interface board converts digital information into a Kansas City-type 1200 Hz/2400 Hz format. The information is recorded and loaded at 1200 baud. The interface can drive two recorders, reading information from one and storing information on the other. Or, you can use just one recorder. When you're loading information onto a tape, the interface board automatically puts a three-second tone on the tape before data transfer begins. The tape operating system looks for this three-second tone when the data is loaded back into the computer.

Another feature of the cassette interface board is that you can reduce the incoming signal by 500 by moving a jumper on the board. The incoming signal is normally about 500 mV peak-to-peak. Installing the jumper reduces the signal to about 1 mV peak-to-peak.

The cassette interface board

NEW

for

CP/M®

Software Tools That Work

- proven
- cost-effective
- thousands in use

Available in standard 8-inch format for most CP/M systems, and 5-inch CP/M and HDOS formats for Heath/Zenith systems.

Written by computer professionals who demand the same high standards in their microcomputer software as they get on bigger machines, these programs have built a reputation for quality, reliability, and performance. The HDOS versions are sold by Heath/Zenith dealers nationwide as well as through independent distributors internationally.

Programs available on standard 8" CP/M, 5" Heath CP/M and HDOS disks:

Programming Languages

C/80	
C Compiler	.....\$39.95
RATFOR	
Fortran language extension	..\$39.95
LISP/80	
LISP interpreter	.....\$39.95
UVMAC/Z80	
Macro assembler for Z80	...\$29.95
UVMAC/8080	
Macro assembler for 8080	...\$29.95

Word Processing & Utilities

TEXT	
Text formatter	.....\$34.95
PACK/CRYPT	
File compression/encryption	..\$24.95

Available for the H89, H8, and Z89 in Heath 5" CP/M and HDOS formats only:

Graphics & Word Processing

PIE	
Full screen text editor	.....\$29.95
ED-A-SKETCH	
Full screen graphics editor	...\$29.95

Utility Programs

CATALOG SYSTEM/UTILITIES (HDOS only)	
Catalog disk library: file dump, compare, etc.	.....\$19.95
REACH (HDOS only)	
Modem and file transfer	....\$19.95

Entertainment

AIRPORT	
Real time action game	.....\$19.95
INVADERS	
Action video game	.....\$19.95
MYCHESS	
Chess champion	.....\$34.95

ORDERING INFORMATION: Specify program name and disk format. Check program listing above for format availability. Add \$2/order (\$3/order for 8" disks) for first class postage and handling. CA residents add 6% sales tax.

The Software Toolworks™

Walt Bilofsky, Prop. ✓ 39
14478 Glorietta Drive
Sherman Oaks, CA 91423
(213) 986-4885

Dealer inquiries invited.

CP/M is a registered trademark of Digital Research, Inc.

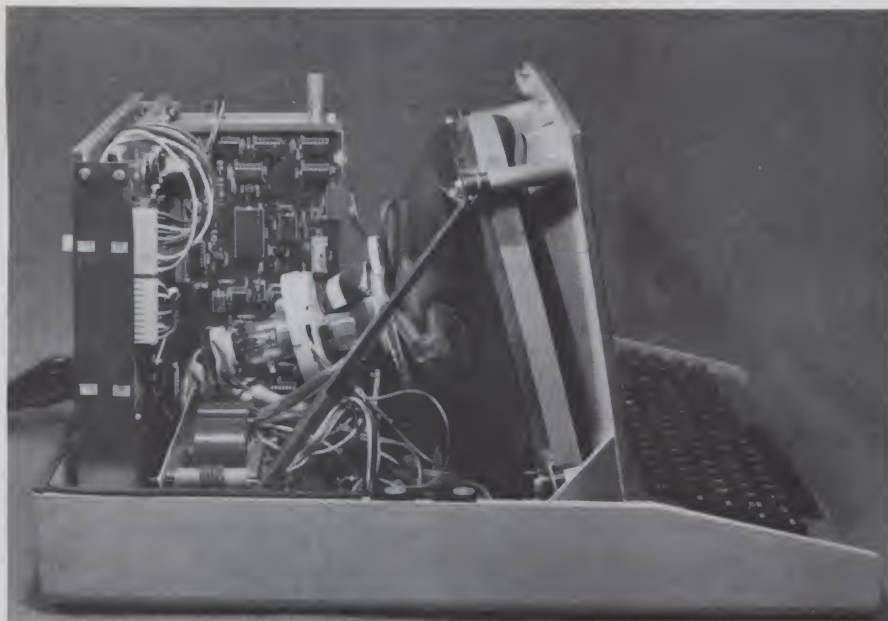


Photo 8. A side view of the H-89. The CPU logic board and terminal logic board run across the rear of the unit. The small board is the cassette interface board. The disk drive is not yet mounted.

mounts onto the CPU logic board. The interface board comes assembled, but you have to put together the cabling from the board to the rear panel.

The LED curiosity—When I mounted the cassette interface board, I noticed an LED lurking around the middle of the board. I looked in the operator's manual to find out about the LED, but was disappointed. It said nothing. The theory of operation was silent on the matter, too.

Well, it turns out that the LED is connected to the input wave shaping circuitry, and indicates whether the information is coming through clearly. If you watch the LED when you're loading information from cassette, you can tell whether the incoming signal is too strong or too weak. If the signal is too strong, the LED glows steadily. If the signal is too weak, the LED doesn't come on at all. A flickering light is just about right. This lets you adjust the volume control on your recorder to the optimum setting.

The Disk Drive and Controller

The drive used in the H-89 is the Model 82 from what used to be the Wangco Division of Perkin-Elmer, before Perkin-Elmer sold the line to Seimens. The drive uses a ten-hole hard-sectored disk, and can store on to 40 tracks. This is a pretty good drive. If you can come up with a controller that will use double-density encoding methods, you can record

double-density. Heath's controller uses single-density recording.

Another nice thing about the drive is that it can be daisy-chained to up to three other drives. That is, you can connect three other drives to the original, without altering the controller board. Heath software currently supports a maximum of three drives. Heath will sell you another two drives with enclosure and power supply for \$895.

The drive is turned off and on by software. This means that you don't have to listen to the drive rotate when it's not doing anything. There is a one-second delay, however, from the time the drive is turned on until it's up to operating speed.

The controller—Heath chose to use an S2350 USRT as the basic controlling element in their disk controller. The S2350 converts the bus parallel data to nonreturn to zero (NRZ) serial data. Other circuitry on the controller converts the NRZ data to the bit cell format required by the drive. The beauty of this controller is its simplicity. No fancy gimmicks or bells and whistles. In other words, not much to go wrong.

Drive calibration—Because the drive is a mechanical device, it will wear with age. One of the things that wears is the drive motor. Rotational speed of the motor must be constant, and must be within set limits. Heath foresaw the need to be able to calibrate the drive motor periodically,

and put a handy little routine in their firmware that calculates the motor's rotational speed. To adjust the drive speed, you pull the drive part way out of the cabinet and turn a potentiometer on the drive, while watching numbers on the H-89 screen.

Firmware/Software —The H-89 Monitor

The H-89 monitor exists in ROM at the bottom 2K of address space.* (This, by the way, is one of the major complaints about the H-89 and H8. A lot of other Z-80 or 8080 computers use software that requires the bottom of memory to be RAM. Heath's monitor precludes easy conversion of other people's software.) The monitor is somewhat primitive, but lets you communicate with the computer without loading external software. You can even enter and execute programs, examine and alter memory, and store and retrieve programs from tape.

When the power is turned on, the H-89 beeps twice, then shows H: on the terminal. The H: is the prompt character. All command entries to the monitor are single-character. The H-89 fills in the rest of the command. For example, if you press "S" (no return required), the terminal will print "SUBSTITUTE." Then it's up to you to enter the address you want to look at or change. The following is a list of monitor commands that can be entered from the keyboard.

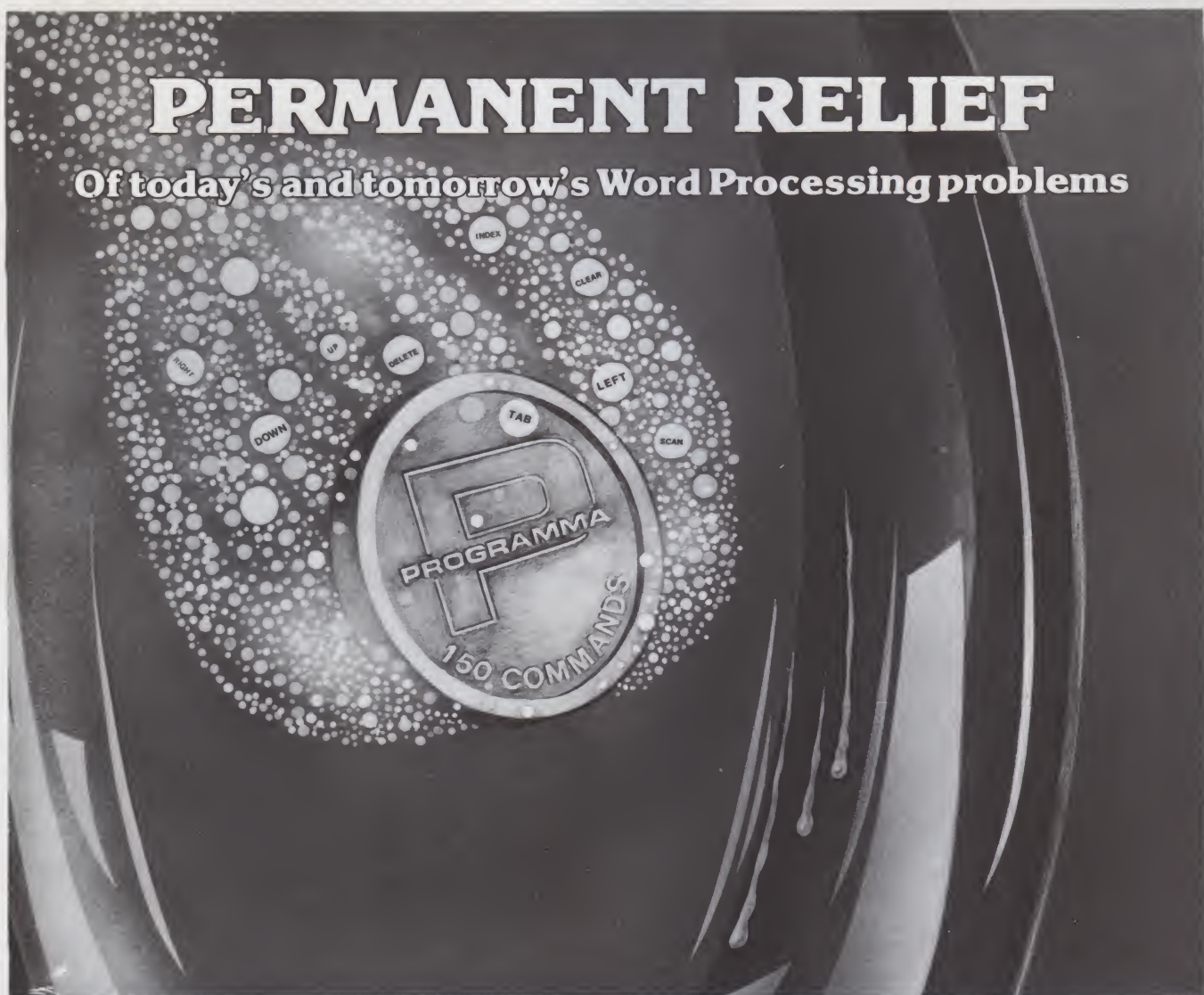
Substitute—This command will let you examine or change a value in RAM. You press "S" and enter the address in split-octal notation. As soon as you've entered the address and pressed return, the monitor places the address and its contents on the terminal screen. At this point, you can change the memory contents, or you can leave them the way they are.

You can look at and change preceding or successive addresses by pushing the dash key or the space bar, respectively. You can quickly cycle through several addresses by holding down the space bar or dash key, and pressing the repeat key. If you want to change a memory value, simply enter the value. If you make a mistake with the first six digits you entered, enter them again. The monitor takes the last value entered. To exit from the SUBSTITUTE command, press return.

Program counter—When you press "P" on the keyboard, the monitor

PERMANENT RELIEF

Of today's and tomorrow's Word Processing problems



Apple PIE

Apple PIE (Programma International Editor) and FORMAT (text formatter) offer full strength solutions to today's word processing problems. These versatile, powerful programs provide document preparation and word processing capabilities previously found only on much larger computer systems.

PIE is a general purpose, full screen editor that uses control keys and function buttons to provide a full range of editing capabilities such as search and replace, delete, copy, insert, move. Changes may be made directly anywhere on the screen and are shown as they are performed.

FORMAT uses simple instructions embedded in the input text to describe the desired appearance of the final document. It handles centering, underlining, indenting, page numbering,

+

Formatter

margins, headers, footers, even form letters, and includes a proofing capability.

These high-quality, cost-effective programs come with comprehensive documentation and run on a 32K Apple II. They are available through your local computer store or direct from Programma International, Inc. at the price of \$129.95.

VIDEX VERSION T.M.
DOUBLE VISION T.M.
SUPR TERM VERSION T.M.
STANDARD VERSION

PROGRAMMA

2908 N. Naomi Street
Burbank, Ca. 91504
(213) 954-0240



✓ 11



Simple enough for the beginner. Versatile enough for the professional.

Now-Break Through The 64K
Micro-Memory Limit!

SWEET SIXTEEN

Bank Selectable 16K Static RAM



SAVE \$50.00
LIMITED TIME OFFER

Don't buy any more antique RAMs (RAM without bank select) — now there's Netronic's new SWEET SIXTEEN board featuring a universal software bank select system. SWEET SIXTEEN is capable of addressing 2,048 different banks. With SWEET SIXTEEN boards you can add memory beyond the 64K limit, or expand to a multi-terminal system.

LOOK AT THESE FEATURES:

- 300 NS, low power 2114's.
- **Software Bank Selector** — Universal decoder works with Cromenco, Alpha Micro, Netronics, most other systems, or your design. Onboard dip switches: Bank Select Enable; Reset Enable; Reset Disable; Port Address; Port Data.
- **All Inputs And Outputs** meet the proposed IEEE standards for the S-100 bus.
- **4.0 MHz Operation.**
- **Schmitt Trigger Buffer** on all signals for maximum noise immunity.
- **Addressable On 16k Boundaries**, 0-64k, dip switch selectable.
- **Phantom Option**, dip switch selectable.
- **PWR/MWRITE Option**, dip switch selectable.
- **LED Indicator** to display status.
- **Glass Epoxy PC Board** with gold-plated contacts and double-sided solder mask.
- **Fully Socketed.**
- **Four Separate Regulators** for maximum stability.

10-Day Money-Back Policy For Wired & Tested Unit: Try a fully wired board — then either keep it, return it for kit, or simply return it in working condition.

Continental U.S.A. Credit Card Buyers
Outside Connecticut:

CALL TOLL FREE:

800-243-7428

From Connecticut Or For Assistance
(203) 354-9375

Please send the items checked below:

☐ **SWEET SIXTEEN kit, No. S-16** ... (reg. price \$249.95) now \$199.95*

☐ **SWEET SIXTEEN, fully assembled, tested, burned in; No. S-16W** ... (reg. price \$289.95) now \$239.95*

*Plus \$2 postage & insurance. Connecticut residents add sales tax.

Total Enclosed: \$ _____

☐ Personal Check ☐ Money Order/Cashier's Check

☐ VISA ☐ Master Charge (Bank No. _____)

Acct. No. _____ Exp. Date _____

Signature _____

Print _____

Name _____

Address _____

City _____

State _____ Zip _____

NETRONICS

RESEARCH & DEVELOPMENT, LTD. KB3
333 Litchfield Rd., New Milford, CT 06776



Photo 9. The completed H-89. Total construction time was about 20 hours.

writes PROGRAM COUNTER on the display, then waits for your next entry. If you hit return, the monitor shows you the current value of the program counter register. At this point, you can enter a new program counter value, or you can hit return to exit.

Go—Pressing "G" will cause the terminal to display GO. You can either enter the address of the first instruction to be executed, or you can just press return, and the H-89 will begin executing at the address already loaded into the program counter register.

Dump—This command lets you save programs on cassette tape. When you press "D," the terminal prints DUMP and waits for you to enter the address range you want stored. One thing that is saved, aside from the program, is the value of the program counter. If, before you enter the DUMP command, you set the program counter value to the first executable instruction location, the program counter will automatically be set to this value when the program is reloaded into the computer.

While the dump is executing, the addresses stored are displayed on the terminal.

Load—The tape load routine reads information back into the H-89 from the cassette tape. If you have several

programs on one tape, you must position the tape at the beginning of the file you want to load. The monitor can't search for a specific file. While the file is being loaded, the monitor validates the information coming in. If a checksum error is detected, the tape loading will stop and the terminal will beep until you reset the computer. Once a tape file is properly loaded, just press "G" followed by a return, and the program will begin to execute.

That summarizes the basic command set of the H-89 ROM monitor. A couple of utility routines are available in the monitor, including the memory test. The memory test loads each RAM location with a number, then goes back and reads the number to see if it was stored correctly. The test then increments the original number and begins again. All the while the terminal shows you the number being used in the test.

Another test in the monitor is the disk drive rotational speed test mentioned before. ■

Part two of this article, which focuses on software, will appear in the next issue of Microcomputing.

*Heath now offers a modification to the H-88 or H-89 that will allow CP/M to run, based at address 000H.

Micro Computer Industries, Ltd. ✓ 167

1520 EAST MULBERRY, SUITE 110
FT. COLLINS, COLO. 80524
PHONE 303-221-1955

CREATE-A-BASE

This data base management program for CBM or PET 32K handles most business data processing chores with one program. No computer experience required. Just turn it on and go!

EXTREMELY FLEXIBLE FEATURES

Create records with up to 24 fields of data of your choosing.
File up to 650 records on each floppy diskette (1800 if you own the 8050 Disk Drive).
Change or add fields at any time.
Change data disks without dumping operating program.
Sort or search by any one or two fields.
Data can be added as \$ amounts, with right hand justification.
Perform arithmetic operations on fields with \$ amounts (+, -, *, /).
Merge files, change or scratch records, output mailing labels.
Completely interactive with WordPro 3 or 4*, output form letters, mailing lists, accounts receivable, invoices, statements, inventories, even reports on your favorite fishing holes (and have more time to go fishing too).
Start the new year off right with Create-A-Base.
You'll pat yourself on the back for months.
Create-A-Base runs on CBM 8032 or 2001 32K machines.
Available on disk only; list price \$200.00.
Price \$200.00
For the 8050 Disk Drive \$360.00
*Word Pro is a registered trademark of Professional Software Inc.

INVENTORY CONTROL

Disk based for CBM or PET 32K
Inventory
Point of Sale
Accounts Receivable
Inventory a minimum of 2000 items per diskette (a lot more with the 8050 Disk Drive.)
Complete records of merchandise purchased and sold.
Update files and supply cost values of stocked items.
Update cash and credit sales, write invoices, remove sales from inventory and keep running total of sales tax.
Cash sales and credit sales.
Maintain a complete record of items charged, payments on account, print bills, sort files and print out summary reports.
List price is only \$200.00

WORDCHECK

WordCheck is the secretary's lifesaver!

Our newest and already one of our fastest selling programs.

This program interacts with WordPro 3 or 4*. Run your letters and documents through WordCheck it checks EVERY SINGLE WORD for spelling or typographical errors.

WordCheck contains a spelling list of most commonly used words. Any words that do not match this list will show up on your screen. If these flagged words are all right pass them by with the pressing of a single key or AUTOMATICALLY add them to the spelling list without having to retype them.

WordCheck is ideal for doctors, lawyers and anyone else doing technical writing. WordCheck is so simple to learn to use your secretary can be working with it in a matter of minutes.

Your worries are over! No more scrambling for the dictionary when you have to write "fluorescent", "nucleotide" or "receive". WordCheck does the work for you quickly, thoroughly and accurately.

Available for CBM and PET 32K** machines with dual disk drives. List price is only \$200.00.

* Word Pro is a registered trademark of Professional Software Inc.

**CBM and PET are registered trademarks of Commodore Business Machines.

PET-TERM ONLINE TERMINAL SOFTWARE FOR THE 8010 OR TNW MODEM

Machine language routines for speedy performance.
All necessary screen and keyboard character conversions.
Control key and special key functions.
Terminal to Disk Storage.
Sequential or Program file transmission capability.
Return to BASIC at will.
Operate Half or Full Duplex.

EXTRAS

Support programs, such as a SEQ FILE READ/EDIT/PRINTER which allows you and your customers to read, edit and printout those data files you will be receiving from the SOURCE and other such data bases. Also provided is a SEQ/PROG DECODER which allows decoding of operating programs which have been transmitted via the 8010 MODEM.

This program and complete operating documentation lists for only \$39.95.

Dollars and Sense

By Gene Embry

Listing 1. DOLLAR.PRT program.

```
0001 : DOLLAR.PRT
0002 :
0003 : Gene Embry
0004 :
0080 GOSUB 9800::Pam. variables
0089 :
0100 : Main
0101 :
0110 INPUT "Enter a dollar amount ",N
0112 IF N>9999.99 PRINT"Too large!":GOTO 900
0114 IF N=0 PRINT "Bye!":END
0116 IF N<.01 PRINT "No checks for nesative dollars!":GOTO 900
0118 LET N1=N
0120 LET N=INT(N*100)::this makes cents
0122 LET N$=STR$(N)::string it out
0124 PRINT "*** ";
0126 IF N<100 PRINT " zero ":GOSUB 1000:GOTO 190
0128 LET A$=N$
0132 LET A=LEN(A$)-1
0140 IF A < 1 THEN 190::done
0150 ON A GOSUB 1000,2000,3000,4000,5000
0160 IF F1=1 THEN A=A-1:F1=0
0170 LET A$=RIGHT$(A$,A)
0180 GOTO 132::do it again
0190 PRINT TAB(W);"$ ";N1
0199 :
0900 : Done
0901 :
0910 PRINT
0990 GOTO 100
0999 :
1000 : Cents
1001 :
1010 LET C$=RIGHT$(N$,2)
1020 PRINT "and ";
1030 PRINT C$;"/100 dollars ***";
1090 RETURN
1099 :
2000 : 0 -> 9 dollars
2001 :
2010 LET B$=LEFT$(A$,1)
2020 LET B=VAL(B$)
2030 IF B=0 THEN 2090
2040 PRINT D$(B);" ";
2090 RETURN
2099 :
3000 : Tens' disit
3001 :
3010 LET B$=LEFT$(A$,1)
3012 LET C$=LEFT$(A$,2)
3020 LET B=VAL(B$)
3022 LET C=VAL(C$)
3030 IF B=0 THEN 3090
3032 IF B+C=0 THEN 3090
```

Have you ever wanted to spell out the dollar amount when using your micro to write checks? This routine will let you do just that, using only 27 English words. Add to the vocabulary the words "zero," "dollars," "hundred" and "thousand," and you can print dollar amounts from 1 cent up to \$9999.99.

DOLLAR.PRT is shown here as a stand-alone program, but it can be incorporated into your normal check-writing program.

The program is shown in Listing 1, and a sample run, including several examples, is shown in Listing 2.

The Program

Lines 1-100—First, a call is made to routine 9800 to pick up the program's global variables. The array D\$() is filled with the English words, which are stored as DATA statements in the 9900 section. A word of caution—you must enter the DATA statements in the order shown.

Lines 100-199—This is the main working section. The dollar amount to be converted is entered via line 110. Three limit tests are then performed in lines 112 to 116. You then multiply by 100 so that the amount, N, is now in cents. If the amount is less than \$1, you print "zero," call the "cents" routine (1000) and conclude by jumping to line 190. If the amount is greater than \$1, you use string (A\$) and its length (A) to perform a number of GOSUBs in line

Address correspondence to Gene Embry, Route 1, Box 151-H, Morrisville, NC 27560.

More

Listing 1 continued.

```

3034 IF C<21 THEN F1=1:GOTO 3050
3040 LET C=20+(B-2)
3050 PRINT D$(C);" ";
3090 RETURN
3099 :
4000 : Hundreds' disits
4001 :
4010 LET B%=LEFT$(A$,1)
4012 LET B=VAL(B%)
4020 IF B=0 THEN GOTO 4090
4030 PRINT D$(B);" hundred ";
4090 RETURN
4099 :
5000 : Thousands' disits
5001 :
5010 LET B%=LEFT$(A$,1)
5020 LET B=VAL(B%)
5030 PRINT D$(B);" thousand ";
5090 RETURN
5099 :
9800 : Program Variables
9801 :
9810 LINE= 0::Disables the line lenath Function
9820 LET D=27::this is # of words needed
9822 DIM D$(D)
9830 FOR X=1 TO D
9832 READ D$(X)::the Enslish words
9834 NEXT X
9840 LET W=60::Position where '$ DDD.CC' is printed
9890 RETURN
9899 :
9900 : Data
9901 :
9910 DATA one,two,three,four,five,six,seven,eight,nine,ten
9920 DATA eleven,twelve,thirteen,fourteen,fifteen,sixteen
9930 DATA seventeen,eighteen,nineteen,twenty,thirty,fourty
9940 DATA fifty,sixty,seventy,eishty,ninety

```

```

RUN
Enter a dollar amount ? 1017.56
*** one thousand seventeen and 56/100 dollars ***      $ 1017.56

Enter a dollar amount ? .04
*** zero and 4/100 dollars ***                          $ 0.04

Enter a dollar amount ? 5.96
*** five and 96/100 dollars ***                          $ 5.96

Enter a dollar amount ? 1234.56
*** one thousand two hundred thirty four and 56/100 dollars ***
                                                                $ 1234.56

Enter a dollar amount ? -4.77
No checks for nesative dollars!

Enter a dollar amount ? 999999999
Too large!

Enter a dollar amount ? 0
Bye!

BASIC
#

```

Listing 2. Sample run.

150.

Which subroutine is called is based on the value of A. Each call will decrement A by 1. You continue until the value of A is less than 1, and conclude by printing out the cents in line 190.

Example

Assume that the value entered is

1017.56. The value of N will be evaluated as 101756 by line 120. A\$ will become 101756, with A taking on the value of 5. Since A is equal to 5, line 150 will cause section 5000, the thousands' digit routine, to be called. The LEFT\$ statement in line 5010 assigns a value of 1 to B\$. The value of B\$ is B, which is 1. Line 5030 looks into the

Introducing



Micro-Computer Educational Programs

Interpretive Education, providing leadership in educational programs for basic living skills, introduces a breakthrough series of new Micro Computer Educational (MCE) programs.

The MCE programs are unique in that they offer automatic branching to individual reading levels, variability in vocabulary levels and are educationally sound.

The new programs are cooperatively designed by a combined team of educators and micro computer specialists. Each program is currently designed for application on Apple II* and TRS-80**.

Please call collect today for more information on how MCE programs can aid your teaching efforts with special needs audiences.



*A trademark of Apple Computer, Inc.
**A trademark of Tandy Corporation

For free information and catalog, write or call collect: (616) 345-8681

IE [®]
INTERPRETIVE EDUCATION
Dept 17H ✓195
2306 Winters Dr. Kalamazoo, MI 49002

If you have (or want) a MODEM, you may need an OLCTD.

The OLCTD (On-Line Computer Telephone Directory) is the source of information about, and news of, Online Computing. Use the OLCTD as a reference in exploring the world of home computer communications.

The OLCTD is easy to read.

Regular features include communications hardware and software reviews, an ongoing series of guides to the use of popular Electronic Message Systems (EMS), news and commentaries, and a directory of hobbyist EMS phone numbers throughout North America and Europe.

The On-Line Computer Telephone Directory

To subscribe to this quarterly publication, send \$9.95 for one year (or \$15.95 for two years) to:

OLCTD
J. A. Cambron Co., Inc. ✓356
P. O. Box 10005
Kansas City, MO 64111

MasterCard and Visa
accepted.
Please include card number and
expiration date with your orders.

Now you can order your subscription to the OLCTD through the FORUM-80 of Kansas City! Call (816) 861-7040, and use the FORUM-80 Online Catalog in the LOCAL FEATURES command.

OHIO SCIENTIFIC

S-FORTH - a full implementation of Fig-FORTH including editor, virtual disk sub-system, and compatibility with OS65D-3 on 5 1/4" or 8" disk. \$29.95.

Source listing \$24.95.
Both for \$49.95.

TOUCH TYPING - 15 lesson set teaches you to use all letters and numerals without the need to look at the keyboard. Requires 32x64 display. 8K. \$19.95.

FAILSAFE +2 - a sophisticated game based on the electronic warfare environment encountered by aircraft during nuclear war. 8K. \$8.95.

INTELLENT TERMINAL EMULATOR - down load, edit, then send files back to host computer. Full or half duplex, many other features. Disk systems. \$24.95.

Send for a FREE complete software and hardware catalog.

✓193

Aurora Software Associates
P.O. Box 99553
Cleveland, Ohio 44199
(216) 221-6981

table D\$(B) and finds the English word one. We print D\$(B) and append thousand.

Upon return we reassign a new value to A\$ via line 170. Its new value is 01756. Then, looping back to line 132, we determine the new value of A is 4 by line 132. Line 150 sends us to routine 4000 to get the English word in the hundreds' position. Since B\$=0 and B will equal 0, we return without doing anything.

Line 170 sets A\$=1756, and we jump back to line 132. Here the value A becomes 3, thus causing us to go to section 3000 to pick up the tens' digit(s).

Since the digits 11 to 19 are uniquely named in English, we must evaluate both the tens' and units' digits at this point. We determine the sum of both digits (B and C) and then take the necessary measures for printing the word from array D\$(). If F1 gets set to 1 upon return, A is decremented one additional time in line 160.

Finally, A has been set to 0, at which time line 140 will cause the program to continue to line 190, which will print the cents. ■



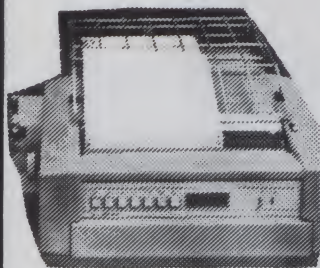
RONDURE COMPANY

✓74

2522 BUTLER ST
DALLAS, TEXAS 75235
214-630-4621

the computer room

SPECIAL Printer for your Microcomputer



Will run on serial RS232 port of
most micros including TRS-80.

GE TERMINET 300 PRINTER

Pin feed—9" paper

- 80 Print positions
- Receive only
- ASCII code
- RS-232 interface
- 30 CPS
- Upper & lowercase
- Shipping w/ 75#

Shipping containers \$15.00.
(used)

(good working condition)

**SALE
\$425.00**

WE HAVE FLAT-PACK ACOUSTIC



Modem
pickup

\$19.50

USED FANS



Muffin—\$7.00
Sprite—\$6.00

CDC POWER SUPPLY

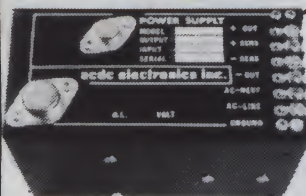
13" x 6" x 6" —

- + 5 at 7 amp
- + 12 at .2 amp
- 12 at 1.5 amp
- + 73 at .5 amp

\$25.

RS 232 Cables Like New

- 6' all pins wired male/female \$25.00
- 8' RS 232 male/male \$12.50
- 15' RS 232 male/male \$20.00
- 25' RS 232 male/male \$22.50
- 50' RS 232 male/male \$45.00



NEW POWER SUPPLY (AC-DC Brand)

Model 1-22V @ 1.9a \$20.00
Model 2-15V @ 2.4a \$30.00

MICRO SWITCH KEYBOARD USED BUT LOOKS VERY NICE



ASC II

\$40.00
(With Print)

USED OMNITEK



MODEM
ORIGINATE
ONLY
TESTED

\$75.00 Sale

ORDERING INFORMATION:

We ship the same day we receive a certified check or money order. Texas residents add 5% sales tax. Send \$1.00 for our CATALOG of many parts, terminals, printers, etc. (credit given on 1st order). All items subject to availability. Your money returned if we are out of stock. Mail order hours 9-4 Monday-Thursday. Closed Fridays.

SHIPPING INFORMATION:

Modems: \$3.00 each; Key Boards \$4.00, Power Supply \$7.00.
Large Items & Parts: Specify Freight or Air Freight Collect.
Foreign Orders: Add appropriate freight or postage.
We now take Master Charge and Visa orders. Specify full number, bank name and expiration date.

**We're the
MAGNOLIA people
you've been
looking for...**

Add the CP/M® disk operating system to your Zenith/Heath '89 All-in-One Computer. Easily installed hardware and software proven by reliable service for more than a year. Supports 8-inch, double-sided 5-inch, and hard disk drives.

Only \$195.

Ask your local dealer, or ✓ 234

**MAGNOLIA
MICROSYSTEMS**
2812 THORNDYKE AVE. WEST
SEATTLE, WASHINGTON 98199

(206) 285-7266

CP/M® is a registered trademark of Digital Research, Inc.

**AIM 65 DEVELOPMENT SYSTEM
DSAIM 65**



The DSAIM 65 is a really complete low cost development system for the 6500 microprocessor family. This powerful development system provides the user with a display of 80 characters by 25 lines, 32K bytes of RAM memory expandable to 64K, over 280K bytes of mass storage on line expandable to over 1 Megabyte, 6 card slots expansion board, Centronics-type printer interface, a powerful disk operating system, BASIC high level language, debug monitor, editor, assembler, powerful system library programs for handling of files by same generic names or extension(s).

Items also sold separately

Call or write for further details. ✓ 334

APPLIED BUSINESS COMPUTER CO.
707 S. State College, Suite G.
Fullerton, Ca. 92631 Tel. 714-871-1411

LEARN

Having trouble
learning to use
your computer?

Reference manuals don't teach. Most BASIC texts don't cover specific personal computers.

TIS solves these problems
with step-by-step books
tailored for your machine.

For PET/CBM

Understanding Your PET/CBM \$16.95
Vol 1: Basic Programming
PET Graphics \$ 6.95

For OSI CIP/C4P

Understanding Your CIP/C4P \$ 9.95
A Workbook of BASIC Exercises

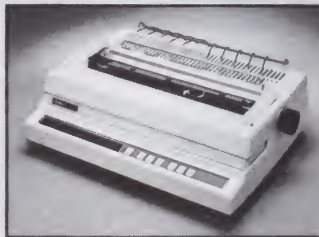
Money Back Guarantee. VISA/MC accepted.

All prices include UPS or 1st Class postage.

TIS, Dept KB ✓ 95
Box 921
Los Alamos, NM 87544



Data Terminals Fast ...from MICROMAIL



DIABLO

630

The Diablo Model 630 is a reliable, high quality, full-character serial printer for anyone who is seeking superior print quality at a low cost. This is the first Diablo printer to offer complete interchangeability between metal and plastic print wheels. And the sophisticated and discerning user does not sacrifice print quality to obtain this versatility. Every aspect of the Diablo 630 design has been focused on maintaining outstanding print quality. Terminals also have self-test, extensive internal diagnostics and automatic bidirectional printing.

\$1,999.00

With Adjustable Forms Tractor add \$200.00

ANADEx

DP-9500/9501

The Anadex Models DP-9500 and DP-9501 Alphanumeric Line Printers are designed for all printer applications, including those requiring high density graphics. Standard features include three standard interfaces (RS 232C, Centronics Parallel, and Current Loop), software selectable print sizes including compressed and expanded print, heavy-duty nine-wire printhead (permits true underlining and descending lower case letters), and fast bi-directional printing. The model 9501 offers slightly higher graphics resolution and a slightly slower print speed than the model 9500.

\$1,299.00



SPECIAL!!

PRINTERS

C.R.T.'s

TELEPRINTERS

ANADEx

DP 9000 \$1199
DP-9001 \$1199

Just like the 9500/9501, but 5 inches narrower. Uses paper up to 9.5 inches wide.

T.I.

810/2 \$1599

(includes upper/lower case option)

810/2 VFC/CP \$1724

(includes u/l case, forms control & compressed print)

DIABLO

1640 RO \$2525

Uses plastic daisywheels, prints up to 45 c.p.s.

1650 RO \$2675

Uses metal daisywheels, prints up to 40 c.p.s.

Tele Video

912C \$ 725
920C \$ 795
950 \$ 995

NEW! Features a detachable keyboard & programmable function keys.

SOROC

IQ120 \$ 689
IQ140 \$1099
IQ135 \$ 849

NEW! Microprocessor controlled, programmable function keys.

C. ITOH

CIT100 \$1625

DEC

VT-100 \$1650

DEC

LA 34 \$ 969
Dot-matrix, 30 c.p.i. Adjustable character sizes & line spacing.

LA 34 AA \$1099
Includes programmable forms length control.

TELETYPE

43 \$ 999
Very reliable 30 c.p.s. teleprinter. Ideal for use with 300-baud acoustic couplers or modems.

DIABLO

1640 KSR \$2830

Uses plastic daisywheels, prints up to 45 c.p.s.

1650 KSR \$2940

Uses metal daisywheels, prints up to 40 c.p.s.



MICROMAIL • BOX 3297 • SANTA ANA, CA 92703
(714) 731-4338

To Order: Send check to MICROMAIL, P.O. Box 3297, Santa Ana, CA 92703. Personal or company checks require two weeks to clear. Visa/MasterCard accepted. C.O.D. requires a 15% deposit. **Handling:** Add 3% to orders less than \$750. 2% to orders \$751-\$2,000. 1% to orders over \$2,000. **NOTE:** Handling charges are waived on orders pre-paid in advance by check. **Shipping:** We ship FREIGHT COLLECT via UPS or Motor Freight. Air and Express delivery is available.

■■■■■■■■■■ SOME STRAIGHT TALK ABOUT DISK DRIVES ■■■■■■■■■■

- DON'T BE CONFUSED BY ALL THE BRAND NAMES YOU SEE IN THE MARKET PLACE, THERE ARE VERY FEW MANUFACTURERS OF THE BASIC DRIVE CHASSIS, ALL THE OTHER NAMES ARE THOSE OF THE ASSEMBLERS OR THE RETAILERS.
- AS MANUFACTURED, THE DRIVE WILL NOT RUN ON A TRS-80, IT MUST BE MODIFIED BY THE ASSEMBLER.
- THE QUALITY OF THE DRIVE DELIVERED TO YOU IS DEPENDENT ON BOTH THE MANUFACTURER AND THE ASSEMBLER, THE BEST CAN TURN TO JUNK IF THE ASSEMBLY IS IMPROPERLY DONE.
- THE POWER SUPPLY AND CASE ARE VERY IMPORTANT COMPONENTS OF THE COMPLETE DRIVE, THE CASE MUST ALLOW PROPER COOLING AIR FLOW, AND THE POWER SUPPLY MUST MAINTAIN TWO CONSTANT VOLTAGES.
- YOU MUST DEPEND ON THE COMPANY SELLING YOU THE DRIVE TO SERVICE IT AT REASONABLE COST WHEN IT FAILS YOU, THE MANUFACTURER IS NOT EQUIPPED TO DO THIS!
- THE BEST MEASURE OF QUALITY IN A DRIVE IS IT'S SPECIFICATIONS, WILL IT HANDLE DOUBLE DENSITY, WHAT IS THE TRACK TO TRACK ACCESS TIME, THE ANSWERS TO THESE TWO QUESTIONS INDICATE THE PRECISION OF IT'S COMPONENTS.
- WHAT KIND OF DRIVE SHOULD YOU BUY? LEVEL IV HAS CHOSEN TO DISTRIBUTE EXCLUSIVELY, THE MPI LINE, ALL MODELS OF MPI ARE DOUBLE DENSITY RATED AND REQUIRE ONLY A FIVE MILLI-SECOND TRACK TO TRACK ACCESS TIME.
- WHAT DO ALL THE MODEL NUMBERS MEAN?

B-51= 40 TRACKS SINGLE HEAD SINGLE SIDE	B-52= 40/40 TRACKS DOUBLE HEAD DOUBLE SIDE
B-91= 80 TRACKS SINGLE HEAD SINGLE SIDE	B-92= 80/80 TRACKS DOUBLE HEAD DOUBLE SIDE

 (DOUBLE HEADS)-READ BOTH SIDES OF DISK (DUALS)-TWO DRIVES IN ONE CASE (RAW)-NO POWER SUPPLY OR CASE
- WHERE SHOULD YOU BUY YOUR DRIVE, LEVEL IV IS ONE OF THE OLDEST AND LARGEST DISTRIBUTORS OF TRS-80 EQUIPMENT, LOOK AT THE ADS IN YOUR OLD MAGAZINES, MANY OF THE ADVERTISERS ARE NO LONGER IN BUSINESS, LEVEL IV HAS BEEN A LEADER SINCE THE BEGINNING, WE STAND BEHIND OUR PRODUCTS, AND WE'LL BE HERE WHEN YOU NEED HELP.
- WHERE DO THE NATIONALLY KNOWN AUTHORS BUY THEIR DRIVES? LEVEL IV CAN SHOW COPIES OF SALES RECEIPTS FOR DRIVES TO MOST OF THEM, LANCE MICKLUS, SCOTT ADAMS, VERNON HESTER, BOB (CAPTAIN 80) LIDDIL, DICK BALCOM, KIM WATT, ETC. TO THESE MEN COMPUTING IS NOT A HOBBY, IT IS THEIR PROFESSION.
- CALL FOR OUR LOW PRICES ON NEW AND USED DRIVES, REMEMBER, WE ALSO TAKE TRADES, AND PAY THE SHIPPING!

LEVEL IV PRODUCTS INC. 32238 SCHOOLCRAFT, LIVONIA, MI 48150
 PHONES: MI (313) 525-6200 OTHERS 800-521-3305 (TOLL FREE)
 ‡ a trademark of the RADIO SHACK DIV. of TANDY CORP. ✓23

SAVE! SAVE! SAVE!

We have discounts, free shipping and
 a TOLL FREE NUMBER available
 Call Us! 800/531-7466

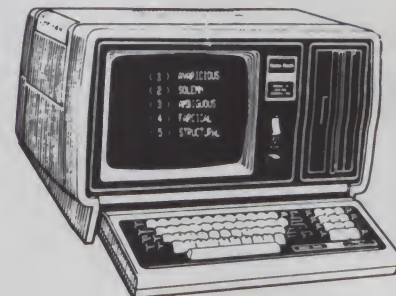
Pan American Electronics

INCORPORATED

Texas and Principle Number 512/581-2765
 Telex Number 767339
 Department K
 1117 Conway
 Mission, Texas 78572

TRS-80's

Microcomputers



Radio Shack®

AUTHORIZED SALES CENTER



We have acquired the rights to all TDL software (& hardware). TDL software has long had the reputation of being the best in the industry. Computer Design Labs will continue to maintain, evolve and add to this superior line of quality software.

— Carl Galletti and Roger Amidon, owners.

Software with Manual/Manual Alone

All of the software below is available on any of the following media for operation with a Z80 CPU using the CP/M* or similar type disk operating system (such as our own TPM*).

for TRS-80* CP/M (Model I or II)
for 8" CP/M (soft sectored single density)
for 5¼" CP/M (soft sectored single density)
for 5¼" North Star CP/M (single density)
for 5¼" North Star CP/M (double density)

BASIC I

A powerful and fast Z80 Basic interpreter with EDIT, RENUMBER, TRACE, PRINT USING, assembly language subroutine CALL, LOADGO for "chaining", COPY to move text, EXCHANGE, KILL, LINE INPUT, error intercept, sequential file handling in both ASCII and binary formats, and much, much more. It runs in a little over 12 K. An excellent choice for games since the precision was limited to 7 digits in order to make it one of the fastest around. \$49.95/\$15.

BASIC II

Basic I but with 12 digit precision to make its power available to the business world with only a slight sacrifice in speed. Still runs faster than most other Basics (even those with much less precision). \$99.95/\$15.

BUSINESS BASIC

The most powerful Basic for business applications. It adds to Basic II with random or sequential disk files in either fixed or variable record lengths, simultaneous access to multiple disk files, PRIVACY command to prohibit user access to source code, global editing, added math functions, and disk file maintenance capability without leaving Basic (list, rename, or delete). \$179.95/\$25.

ZEDIT

A character oriented text editor with 26 commands and "macro" capability for stringing multiple commands together. Included are a complete array of character move, add, delete, and display function. \$49.95/\$15.

ZTEL

Z80 Text Editing Language - Not just a text editor. Actually a language which allows you to edit text and also write, save, and recall programs which manipulate text. Commands include conditional branching, subroutine calls, iteration, block move, expression evaluation, and much more. Contains 36 value registers and 10 text registers. Be creative! Manipulate text with commands you write using Ztel. \$79.95/\$25.

TOP

A Z80 Text Output Processor which will do text formatting for manuals, documents, and other word processing jobs. Works with any text editor. Does justification, page numbering and headings, spacing, centering, and much more! \$79.95/\$25.

MACRO I

A macro assembler which will generate relocateable or absolute code for the 8080 or Z80 using standard Intel mnemonics plus TDL/Z80 extensions. Functions include 14 conditionals, 16 listing controls, 54 pseudo-ops, 11 arithmetic/logical operations, local and global symbols, chaining files, linking capability with optional linker, and recursive/reiterative macros. This assembler is so powerful you'll think it is doing all the work for you. It actually makes assembly language programming much less of an effort and more creative. \$79.95/\$20.

MACRO II

Expands upon Macro I's linking capability (which is useful but somewhat limited) thereby being able to take full advantage of the optional Linker. Also a time and date function has been added and the listing capability improved. \$99.95/\$25.

LINKER

How many times have you written the same subroutine in each new program? Top notch professional programmers compile a library of these subroutines and use a Linker to tie them together at assembly time. Development time is thus drastically reduced and becomes comparable to writing in a high level language but with all the speed of assembly language. So, get the new CDL Linker and start writing programs in a fraction of the time it took before. Linker is compatible with Macro I & II as well as TDL/Xitan assemblers version 2.0 or later. \$79.95/\$20.

DEBUG I

Many programmers give up on writing in assembly language even though they know their programs would be faster and more powerful. To them assembly language seems difficult to understand and follow, as well as being a nightmare to debug. Well, not with proper tools like Debug I. With Debug I you can easily follow the flow of any Z80 or 8080 program. Trace the program one step at a time or 10 steps or whatever you like. At each step you will be able to see the instruction executed and what it did. If desired, modifications can then be made before continuing. It's all under your control. You can even skip displaying a subroutine call and up to seven breakpoints can be set during execution. Use of Debug I can pay for itself many times over by saving you valuable debugging time. \$79.95/\$20.

DEBUG II

This is an expanded debugger which has all of the features of Debug I plus many more. You can "trap" (i.e. trace a program until a set of register, flag, and/or memory conditions occur). Also, instructions may be entered and executed immediately. This makes it easy to learn new instructions by examining registers/memory before and after. And a RADIX function allows changing between ASCII, binary, decimal, hex, octal, signed decimal, or split octal. All these features and more add up to give you a very powerful development tool. Both Debug I and II must run on a Z80 but will debug both Z80 and 8080 code. \$99.95/\$20.

ZAPPLE

A Z80 executive and debug monitor. Capable of search, ASCII put and display, read and write to I/O ports, hex math, breakpoint, execute, move, fill, display, read and write in Intel or binary format tape, and more! on disk

APPLE

8080 version of Zapple

NEW! TPM now available for TRS-80 Model II!

TPM*

A NEW Z80 disk operation system! This is not CP/M*. It's better! You can still run any program which runs with CP/M* but unlike CP/M* this operating system was written specifically for the Z80* and takes full advantage of its extra powerful instruction set. In other words its not warmed over 8080 code! Available for TRS-80* (Model I or II), Tarbell, Xitan DDDC, SD Sales*VERSA-FLOPPY*, North Star (SD&DD), and Digital (Micro) Systems. \$79.95/\$25.

SYSTEM MONITOR BOARD (SMB II)

A complete I/O board for S-100 systems. 2 serial ports, 2 parallel ports, 1200/2400 baud cassette tape interface, sockets for 2K of RAM, 3-2708/2716 EPROM's or ROM, jump on reset circuitry. Bare board \$49.95/\$20.

ROM FOR SMB II

2KX8 masked ROM of Zapple monitor. Includes source listing \$34.95/\$15.

PAYROLL (source code only)

The Osborne package. Requires C Basic 2.
5" disks \$124.95 (manual not included)
8" disks \$ 99.95 (manual not included)
Manual \$20.00

ACCOUNTS PAYABLE/RECEIVABLE (source code only)

By Osborne, Requires C Basic 2
5" disks \$124.95 (manual not included)
8" \$99.95 (manual not included)
Manual \$20.00

GENERAL LEDGER (source code only)

By Osborne, Requires C Basic 2
5" disks \$99.95 (manual not included)
8" disks \$99.95 (manual not included)
Manual \$20.00

C BASIC 2

Required for Osborne software. \$99.95/\$20.

SYSTEM/6

TPM with utilities, Basic I interpreter, Basic E compiler, Macro I assembler, Debug I debugger, and ZEDIT text editor.

Above purchased separately costs \$339.75

Special introductory offer: Only \$179.75 with coupon!!

\$160.

This Coupon Is Worth
One Hundred And Sixty Dollars
Toward The Full Price Of The
SYSTEM/6 Package
System/6 with this coupon is only \$179.95.
This is a limited time offer.

\$160.00

ORDERING INFORMATION

Visa, Master Charge and C.O.D. O.K. To order call or write with the following information.

1. Name of Product (e.g. Macro I)
2. Media (e.g. 8" CP/M)
3. Price and method of payment (e.g. C.O.D.) include credit card info. if applicable.
4. Name, Address and Phone number.
5. For TPM orders only: Indicate if for TRS 80, Tarbell, Xitan DDDC, SD Sales (5¼" or 8"). ICOM (5¼" or 8"), North Star (single or double density) or Digital (Micro) Systems.
6. N.J. residents add 5% sales tax.

Manual cost applicable against price of subsequent software purchase in any item except for the Osborne software.

For information and tech queries call
609-599-2146

For phone orders ONLY call toll free
1-800-327-9191
Ext. 676

(Except Florida)

OEMS

Many CDL products are available for licensing to OEMs. Write to Carl Galletti with your requirements.

- * Z80 is a trademark of Zilog
 - * TRS-80 is a trademark for Radio Shack
 - * TPM is a trademark of Computer Design Labs. It is not CP/M*
 - * CP/M is a trademark of Digital Research
- Prices and specifications subject to change without notice.

DEALER INQUIRIES INVITED.

**COMPUTER
DESIGN
LABS**

342 Columbus Avenue
Trenton, N.J. 08629

Write Your Own Pseudo-FORTH Compiler

By Richard Fritzson

This compiler, for a simple threaded language similar to FORTH, extends the interpreter for the language described in "Write Your Own FORTH Interpreter" (*Microcomputing*, February 1981, p. 76). The compiler takes reverse Polish notation statements exactly like those typed into the interpreter along with standard programming language control statements such as IF-THEN-ELSE and FOR-LOOP, compiles them into threaded code and stores them in the dictionary associated with a user-defined name.

The compiler is written almost entirely in threaded code and is simply added to the basic interpreter described in the first article, with only one or two simple modifications to

the already existing code.

I should point out again that although the language being described is similar to FORTH in many ways, it is not really FORTH. It does not conform to the FORTH implementation standards (see references), nor is it the same language sold by FORTH, Inc. I believe that threaded-code-based systems are so inherently flexible that computerists should use them to devise languages which suit them and to perform software experiments. It would be easy for anyone who is interested to modify the system presented here to conform to a given set of standards.

Language Overview

In this language, every program

and subroutine has a name. The traditional name in FORTH for the compiler is a single colon, which introduces a new definition. It is followed by the name of the function being defined, then by the code which comprises the new routine, then finally by a semicolon which terminates the definition. Table 1 contains a few simple examples. (The lowercase text is annotation added after the interaction with the compiler. See the extensions section for suggestions on how to add a comment facility.)

While the typed-in language does not let you use the control statements that most programming languages have, such as GOTO, IF-THEN, etc., not much computing can be done without them. This compiler will handle the standard IF-THEN-ELSE statements, as well as two typical looping statements: the FOR LOOP and the REPEAT LOOP (both similar to the Pascal statements of the same name).

Because all of the functions in this language require their arguments to be on the stack, even these standard control statements are written in reverse Polish notation. This will make them seem strange at first. You can either learn to like this or you can write a better compiler. You'll see that doing the latter is not as hard as you might think.

Even though the language here only supports 16-bit integers for data, we will interpret these numbers as logical values when appropriate by using zero to mean false and nonzero to mean true.

The syntax of the IF statement is shown in Table 2. It is the word IF,

- : ADD + ;	define ADD to be the same as +
0	
- 3 5 ADD	notice the system prints the top of the stack after each interaction
8	
- : R CLEAR 0 ;	define R to CLEAR the stack and push a zero; notice the stack doesn't change until R is executed
8	
- R	
0	
- : ECHOWORD READLINE SCAN POP PRINTS ;	define ECHOWORD to read a line, get one word and print it; notice that definitions may use several lines
0	
- ECHOWORD	executing ECHOWORD; the zero at the end of the echoed word is the value of the stack being printed without a preceding carriage return
HELLO	
HELLOO	
-	typing just a carriage return just gets you the stack value
0	
-	

Table 1. Simple compiler definitions.

Send correspondence to Richard Fritzson, 25 Cal-lodine Ave., Amherst, NY 14226.

condition	IF	word 1 word 2 word 3	the IF statement without the ELSE
	THEN		
condition	IF	word 1 word 2 word 3	the IF statement with the ELSE
	ELSE	word 4 word 5	
	THEN		
- : TEST 5	EQ	IF 1 ELSE 0 THEN ;	definition of a trivial function to replace a 5 with a 1 and all other numbers with a 0.
			EQ is a function which tests the top two elements of the stack and leaves a "true" if they were equal and "false" if not

Table 2. The IF-ELSE-THEN statement.

preceded by code which calculates the condition to be tested, and followed by code to be executed when the condition is true. The code is terminated by "THEN." Optionally, the word ELSE can be inserted before the THEN, followed by code to be executed only when the condition is false.

The "condition" is the top of the stack when the IF is executed. IF pops and examines the top of the stack. If it is false (zero), control transfers to the next instruction after the matching ELSE if there is one, or after the matching THEN if there is no ELSE. The ELSE statement, when encountered during the execution of the code following the IF, causes a jump to the matching THEN statement. Examples are shown in Table 2. Again, the syntax is a bit unusual, but it does follow in a reasonable way from the need to use reverse Polish notation.

The syntax for the REPEAT statement is shown in Table 3. The word REPEAT is followed by the code to be repeated, terminated by the word LOOP. At any point between the REPEAT and the LOOP you can put an UNTIL test which, like IF, pops and examines the top of the stack. If it is true (nonzero), control transfers to the instruction following the LOOP word, exiting the loop. If it is false (zero), execution continues with the next instruction following the UNTIL.

Putting the UNTIL immediately prior to the LOOP simulates the action of Pascal's REPEAT-UNTIL loop. Putting it at the beginning of the

loop and preceding it with a logical NOT statement simulates Pascal's

WHILE-DO loop. Putting the UNTIL anywhere else gives you a flexible, yet still structured, loop instruction. Examples are shown in Table 3.

The FOR statement (Table 4) gives you the indexed iteration found in most programming languages (e.g., the FOR-NEXT loop in BASIC and the DO LOOP in FORTRAN). When FOR is executed, it pops the top value of the stack and uses it as the starting value of the index variable; the second element of the stack is used as the final value. All of the code between the FOR and LOOP words is executed once for each value of the index variable. (Note that in this version the starting and ending values are both positive, and the only increment possible is one.)

Nested FOR LOOPS are allowed to a depth determined by the size of an independent *loop stack* reserved for holding the looping variables. The current value of the index variable is

REPEAT	typical REPEAT LOOP
word1	Words 1, 2, 3, 4 and 5 are executed repeatedly until the top of the stack after word 3 is nonzero.
word2	
word3 UNTIL	
word4	
word5	
LOOP	
- : GETWORD	define GETWORD to READLINEs until SCAN finally returns a word. Remember that SCAN returns true at the top of the stack when it succeeds in finding a word.
REPEAT	
SCAN UNTIL	
READLINE	
LOOP ;	
0	
- : READ# REPEAT	READ# keeps on reading words until one of them can be successfully converted to a number
GETWORD	
CONAXB UNTIL	
POP	
LOOP ;	
0	
- READ#	test READ#
hello	(it just ignores non-numbers)
ss34	
123	
123	(and leaves the number at top)
- : SUM REPEAT	SUM adds all numbers on the stack until it encounters a zero
SWAP	-get second number and duplicate it
DUP	-quit looping if it is zero
EQZ UNTIL	-else add it to next element
+	-and loop
LOOP	-drop the zero leaving the SUM
POP ;	
0	
- 0 1 2 3 4 5 SUM	test SUM
15	
- 0 1 3 5 7 9 SUM	test SUM
25	

Table 3. The REPEAT LOOP.


```

last first FOR
      word1
      word2
      word3
      LOOP

```

The FOR LOOP executes repeatedly for index values from *first* to *last*

```

FOR I = first TO last

```

It is equivalent to the BASIC FOR NEXT loop.

```

NEXT I

```

```

- : SIGMA
      0 SWAP
      1 FOR
        I +
      LOOP ;

```

SIGMA adds the numbers from 1 up to its argument by starting with zero and adding "I" inside a FOR LOOP

```

0
- 3 SIGMA
6
- 10 SIGMA
55

```

test SIGMA

test SIGMA

```

- : 2**N

```

2**N calculates 2 to the N, where N is the top of the stack

```

      1
      SWAP 1 FOR
        DUP +
      LOOP ;

```

(starting value = 2**0)
(repeat from 1 to N)
(double the number)

```

55
- 5 2**N
32
- 10 2**N
1024
-

```

test 2**N

test 2**N

Table 4. The FOR LOOP.

accessible through the functions I, J and K. "I" puts the value of the index variable on the stack. "J" is used in a nested pair of loops and puts the value of the outer LOOP's index variable on the stack. "K" is used for triply nested FOR LOOPS and puts the value of the outermost (the third) LOOP's index variable onto the stack. Table 4 contains some examples.

The entire language is built of subroutine calls or function names, so of course there is no explicit subroutine CALL or GOSUB statement. There is no GOTO out of respect for the principles of structured programming. These three control structure statements should let you do anything you need. If you really want a GOTO statement, adding one is a little tricky, but possible and maybe worth trying.

One other feature of the language is that it permits recursive definitions of subroutines. Since parameters, local variables, looping indices and return addresses are all on stacks, these

recursive definitions will all work just fine. Table 5 contains some examples; I sometimes find them easier

to write than nonrecursive statements. However, you must remember that recursive programs consume return stack space, so you cannot use them to replace looping all of the time (unless you have a lot of return stack space).

Compiler Design

To make the compiler easy to modify and expand, it is as structured as possible. The operation of the main compiler routine is described by the algorithm in Table 6.

For most words of the language—the names of the subroutines in the dictionary—the only compiler action is to store the address of the subroutine in the compiled code (since that is all there is to threaded code). When number constants appear inside a definition, the compiler stores code that, when executed, pushes the number onto the stack (the same way the interpreter pushes numbers on the stack when you type them in). Of course, numbers that are defined as constants in the dictionary are handled in the same way as other entries in the dictionary; the compiler just stores the address of the entry. All of the special compiler language words such as IF, REPEAT, semicolon, etc., are stored in a special dictionary, and the action taken for each is defined as a separate subroutine associated with the dictionary entry.

The organization of the separate dictionary is shown in Table 7. Although the names of the compiler's words are separate from the names of

```

- : SUM

```

the recursive definition of SUM does the same thing as the iterative: it adds the numbers on the stack until it encounters a zero

```

      SWAP DUP EQZ IF
        POP
      ELSE
        +
      SUM
      THEN ;

```

(test if second element is a zero)
(if yes, then drop it)
(else add the top two numbers)
(and SUM the result and the rest)

```

0
- 0 4 3 5 5 7 SUM
24
- : GETWORD
      SCAN EQZ IF
        READLINE
        GETWORD
      THEN ;

```

a recursive definition of GETWORD
(scan current line, if scan fails)
(then READLINE)
(and call GETWORD)

```

24
-

```

Table 5. Some simple recursive definitions.

Now NRI takes you inside the new TRS-80 Model III microcomputer to train you at home as the new breed of computer specialist!

NRI teams up with Radio Shack advanced technology to teach you how to use, program and service state-of-the-art microcomputers...

It's no longer enough to be just a programmer or a technician. With microcomputers moving into the fabric of our lives (over 200,000 of the TRS-80™ alone have been sold), interdisciplinary skills are demanded. And NRI can prepare you with the first course of its kind, covering the complete world of the microcomputer.

Learn At Home in Your Spare Time

With NRI training, the programmer gains practical knowledge of hardware, enabling him to design simpler, more effective programs. And, with advanced programming skills, the technician can test and debug systems quickly and easily.

Only NRI gives you both kinds of training with the convenience of home study. No classroom pressures, no night school, no gasoline wasted. You learn at your convenience, at your own pace. Yet



Training includes new TRS-80 Model III microcomputer, solid state volt-ohm meter, digital frequency counter, and the NRI Discovery Lab with hundreds of tests and experiments.

(TRS-80 is a trademark of the Radio Shack division of Tandy Corp.)



you're always backed by the NRI staff and your instructor, answering questions, giving you guidance, and available for special help if you need it.

You Get Your Own Computer to Learn On and Keep

NRI training is hands-on training, with practical experiments and demonstrations as the very foundation of your knowledge. You don't just program your computer, you introduce and correct faults...watch how circuits interact...interface with other systems...gain a real insight into its nature.

You also build test instruments and the NRI Discovery Lab, performing over 60 separate experiments in the process. You learn how your troubleshooting tools work, and gain greater understanding of the information they give you. Both microcomputer and equipment come as part of your training for you to use and keep.

Send for Free Catalog... No Salesman Will Call

Get all the details on this exciting course in NRI's free, 100-page catalog. It shows all equipment, lesson outlines, and facts on other electronics courses such as Complete Communications with CB, TV and Audio, Digital Electronics, and more. Send today, no salesman will ever bother you. Keep up with the latest technology as you learn on the latest model of the world's most popular computer. If coupon has been used, write to NRI Schools, 3939 Wisconsin Ave., Washington, D.C. 20016.



NRI Schools
McGraw-Hill Continuing
Education Center
3939 Wisconsin Avenue
Washington, D.C. 20016
NO SALESMAN WILL CALL
Please check for one free catalog only.

- ☐ Computer Electronics Including Microcomputers
- ☐ TV/Audio/Video Systems Servicing
- ☐ Complete Communications Electronics with CB • FCC Licenses • Aircraft, Mobile, Marine Electronics
- ☐ CB Specialists Course

- ☐ Digital Electronics • Electronic Technology • Basic Electronics
- ☐ Small Engine Repair
- ☐ Electrical Appliance Servicing
- ☐ Automotive Mechanics
- ☐ Auto Air Conditioning
- ☐ Air Conditioning, Refrigeration, & Heating including Solar Technology

Name _____ (Please Print) Age _____

Street _____

City/State/Zip _____

Accredited by the Accrediting Commission of the National Home Study Council

172-031


```

1) Set Compiler Flag to zero
2) Read the Function Name
3) Store the Name and Code pointer in the NAMES section of the dictionary
4) Store a threaded code call (TCALL) as the first word of the compiled definition
5) REPEAT
    Get the Next Word (ignoring line boundaries)
    IF it is a compiler word (e.g., IF, REPEAT, etc.)
    THEN
        Execute it
    ELSE
        IF it is defined in the dictionary
        THEN
            Store its address in the code
        ELSE
            IF it is a number
            THEN
                store a push instruction
                store the number
            ELSE
                Error—abort compilation
    UNTIL the Compiler Flag is not zero

```

Table 6. The compiler algorithm.

the interpreter's words, the code for both types of entries is intermixed. The compiler part of the dictionary is stored at the top of memory to let the interpreter expand the other part more easily. It would not be difficult to write a program that moved these dictionary parts around and allowed you to expand the compiler (adding, for example, new control statements) in the same way you expand the interpreter.

One reason the compiler is so simple is that it does not do any syntax checking. This means that most syntactic errors will simply cause the compiler to generate bad code. One simple check that is not too difficult to add is to make sure that all of the REPEATs are balanced with UNTILs and LOOPS, that every FOR has a LOOP, that every IF has a THEN and every ELSE has a matching IF-THEN. This only requires that you keep count of the different statements.

A more interesting and more difficult check would be to see to it that no control statement crossed over the boundary of another. For instance, no FOR LOOP can begin inside an IF statement but end outside. Notice that you can't make a REPEAT LOOP begin inside a FOR LOOP but end outside; the compiler will interpret it in the correct way.

As we'll see, compiling code for the IF-THEN-ELSE and REPEAT-LOOP is easy; they're just conditional jumps. The FOR-LOOP, however, requires a bit of work because there is so much to be done for one. The first

time the FOR is executed, the numbers on the parameter stack have to

be moved to the special loop stack. On each iteration the index variable (on the loop stack) has to be incremented and compared with the final value (also on the loop stack). If it exceeds the final value, the numbers have to be cleared off the loop stack and control transferred to the next instruction after the LOOP.

This whole set of operations is so common to computer programs that some computers have hardware instructions for it (e.g., the Z-80 has a "decrement B and jump if the result is not zero") to make things easy for the compiler and to speed up execution of the loop. For just those reasons we handle this by adding to our threaded code interpreter two new primitives: one for initializing a FOR LOOP and one for incrementing and testing the index variable.

Implementation: The Main Compiler Routine

Listing 1a contains the main compiler routine as it would look if it

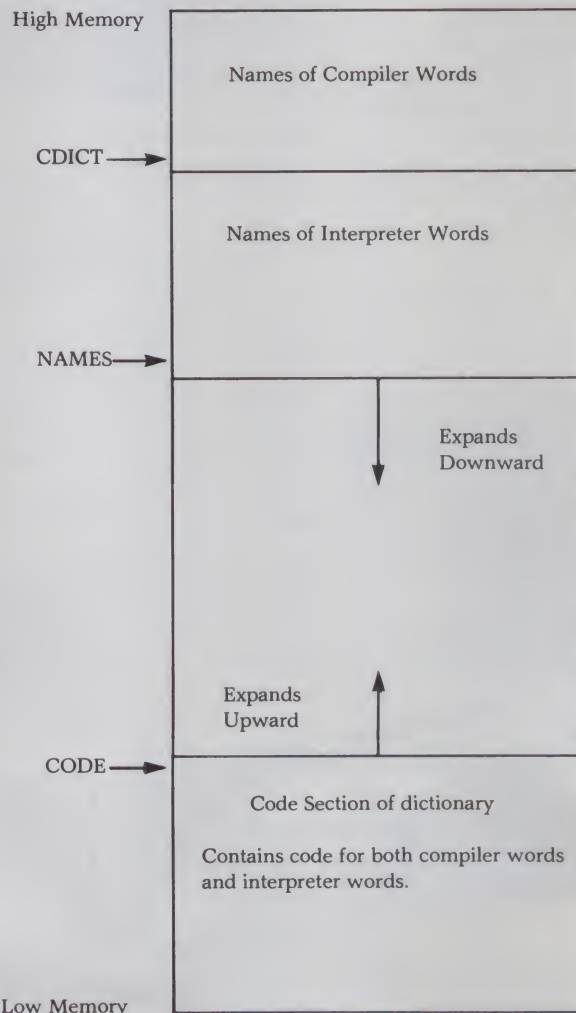


Table 7. Organization of memory. For dictionary details see Fig. 15 of part 1.

- ::		redefining the colon
0 CFLAG POKEW		set compiler flag to zero
GETWORD		read the function name
ENTER		and enter it into the dictionary
@TCALL CMPLW		compile the address of the TCALL code
		(NOTE: @TCALL is a CONSTANT; see text)
REPEAT		
GETWORD		get next function word
CDICT PEEKW		get start of compiler word dictionary
LOOKUP		and lookup the word
IF		
EXECUTE		if found, execute it
ELSE		else
NAMES PEEKW		look in the interpreter's dictionary
LOOKUP		
IF		
CMPLW		if found, compile the word into the code
ELSE		
CONAXB		else try interpreting it as a number
IF		
@PUSH CMPLW		if successful, store a PUSH instruction
CMPLW		and the number itself
ELSE		
CERROR		otherwise issue an error
THEN		
THEN		
CFLAG PEEKW UNTIL		check the compiler flag
LOOP		and continue compiling until it is true

Listing 1a. The main compiler routine. This function was not actually typed in. Not all of the words used here are defined in the code. It is for illustrative purposes only. However, there is no reason that it cannot be made to work.

Listing 1b. Interactive threaded code compiler.

```

; Interactive Threaded Code Compiler
;
; This is the interactive compiler routine. Its
; name in the dictionary is ":" (a colon). It
; is called with the following syntax:
;
; - : NAME FN1 FN2
;   FN3 FN4 ... FNN ;
;
; where name is the name of the new function being
; compiled and FN1 through FNN are the
; words which make up the new function. The
; final semicolon terminates the definition.
; This code is not optimized, but is exactly
; what would be produced if it were compiled by
; itself.

COMPILE
03C3 4702          DW      TCALL          ;threaded code CALL
03C5 6C034703BD    DW      ZERO,CFLAG,POKEW ;clear the compile flag
03CB 53035C05       DW      GETWORD,ENTER   ;get and store name
03CF C7024702B3    DW      TPUSH,TCALL,CMPLW ;compile threaded call

03D5 5303          COMPL1 DW      GETWORD    ;get next word
03D7 6804AB022E    DW      CDICT,PEEKW,LOOKUP ;look in compiler dict
03DD 0503E603      DW      IFZ,COMPL2-1      ;if not found
03E1 9104          DW      EXECUTE          ;else execute
03E3 F5021004      DW      JUMP,COMPL5-1      ;and continue

03E7 6004AB022E    DW      NAMES,PEEKW,LOOKUP ;look in interpreter dict
03ED 0503F603      DW      IFZ,COMPL3-1      ;if not found
03F1 B305          DW      CMPLW            ;else store in definition
03F3 F5021004      DW      JUMP,COMPL5-1      ;and continue

03F7 8508          COMPL3 DW      CONAXB      ;try interpreting as a num
03F9 05030804      DW      IFZ,COMPL4-1      ;if not
03FD C702C702B3    DW      TPUSH,TPUSH,CMPLW ;else compile code to
0403 B305          DW      CMPLW            ;push the number
0405 F5021004      DW      JUMP,COMPL5-1      ;and continue

0409 A307          COMPL4 DW      PRINTS      ;print the string
040B C7021F04      DW      TPUSH,CUMSG       ;push error message

```

More →

SIEMENS FLOPPY DISK SALE!

■ We are an OEM for SIEMENS disk drives, and have we got a deal for you! Floppy Disk Services is selling the latest and greatest disk drives direct to you at prices you can't find anywhere else. We buy in big quantities to set the best prices and pass that savings on to you.

■ Looking for 8" drives? The FDD-100-8 is the latest most updated model from SIEMENS. Single sided single or double density. These drives are built on tough chassis for years of trouble free use. They are rack mountable and Shugart compatible, both physically and electrically. Power requirements are simple just +24v and +5v, negative voltage not required. The motor is A.C. driven.

■ Need 5.25" drives? The FDD-100-5 is for you. These drives are 35 or 40 track models and like their big brothers are the latest models from SIEMENS. They work perfectly with the TRS-80 Mod 1 and are direct replacements for the drives used in Heath computers. Powered by just +12 and +5vdc.

ask about our 8" drive package for the TRS-80 MOD II — \$950.00 for TWO drive system

FDD-100-8d ... \$360.00 2 for \$710
FDD-100-5b ... \$230.00 2 for \$450
power conn. set 8" ... \$3.50
Manuals (8" or 5.25") ... \$12.00

All shipping collect via U.P.S.
Prepay your order & we pay shipping
Mastercharge and Visa accepted

Floppy Disk Services Inc.

C.N. 5212 ✓191
Princeton, N.J. 08540
(609) 771-0374

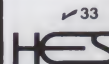
the wait is over!
THE 6502 ASSEMBLER
for your 8K PET
is now available!
by Jay Balakrishnan **PET**

Now that many 6502 Assembler books are available, this Assembler enables you to code machine language programs that run 100 or more times faster than BASIC

- Uses 1 tapedrive; almost 1K free for your machine language program
- Handles all opcodes & several pseudo-opcodes, and accepts hex/dec. operands
- Symbols are 6 characters in length, but that length is easily modified
- Versions for old and new ROMs included
- Comprehensive documentation includes separate User & Program Manuals which facilitates easy program enhancements
- Over 25 English language error messages also numbered for easy reference
- GUARANTEED to load or replaced FREE

only \$15.95

Plus \$1 Postage • Diskette - Add \$2
(Calif. residents add 6% Sales Tax)



Human Engineered Software
3748 Inglewood Blvd. Room 11
Los Angeles, California 90066



(213) 398-7259

dealer inquiries welcomed

Listing 1b continued.

```

040F EB05          DW      UERROR          ;compiler error routine

0411 4703AB02      COMPL5 DW      CFLAG,PEEKW      ;check compiler flag
0415 18031C04      DW      IFNZ,COMPL6-1          ;if not zero, quit
0419 F502D403      DW      JUMP,COMPL1-1          ;else continue

041D 5B02          COMPL6 DW      TRET           ;return when done

041F 0E20697320CUMSG DB      14,' is undefined.'
                        PAGE

```

```

; Top Level External Interpreter Version 1.0
;
; This routine reads one line of reverse
; polish notation from the console and executes it.
;
; Version 1.5: The code has been modified to provide
; LOOKUP with the address of the beginning of the
; interpreter dictionary.
INTERACT
0381 4702          DW      TCALL           ;threaded code

0383 9507          DW      PROMPT          ;prompt the user and
0385 9904          DW      READLINE        ;read a console line

0387 E407          SLOOP DW      SCAN       ;scan for next word
0389 0503AC03      DW      IFZ,EXIT-1      ;if end of line, quit
038D 6004AB02      DW      NAMES,PEEKW     ;else lookup word in
0391 2E04          DW      LOOKUP          ;interpreter dictionary
0393 05039C03      DW      IFZ,NUMBER-1    ;if not found, try number

0397 9104          DW      EXECUTE         ;else execute it
0399 F5028603      DW      JUMP,SLOOP-1     ;and continue scanning

039D 8508          NUMBER DW      CONAXB    ;try converting to binary number
039F 18038603      DW      IFNZ,SLOOP-1    ;if succesful, leave on stack
                                           ;and continue scanning

03A3 C702B503      DW      TPUSH,ERRMSG    ;else push error message
03A7 A307          DW      PRINTS          ;and print it
03A9 A307          DW      PRINTS          ;then print string
03AB 5B02          DW      TRET           ;and return

03AD E5023108      EXIT  DW      DUP,CONBXA ;copy and convert top of stack
03B1 A307          DW      PRINTS          ;print it
03B3 5B02          DW      TRET           ;return

03B5 0D4E6F7420ERRMSG DB 13,'Not Defined: '
                        PAGE

```

Listing 2a. Top level external interpreter, version 1.0.

```

; LOOKUP - the dictionary lookup routine
; ENTRY: TOP - pointer to top of dictionary
; TOP-1 - pointer to string to be looked up
; EXIT: TOP - -1 if string found in dictionary
;         0 if string not found
;         TOP-1 - pointer to code of found subroutine
;         or
;         string pointer if not found
; DESCRIPTION: performs a linear search of the
; dictionary. Returns the code address if the string
; is found, or else the string pointer if not found.
;
; Version 1.5: This routine has been modified to
; accept the dictionary address as a parameter.
042E 4702          LOOKUP DW      TCALL     ;threaded code

0430 E502A102      SEARCH DW      DUP,PEEKB  ;get character count of next entry
0434 05034B04      DW      IFZ,FAIL-1      ;if end of dictionary

0438 6C04          DW      MATCH           ;else attempt a match
043A 18035104      DW      IFNZ,SUCCEED-1  ;if succesful match

043E C1077E02      DW      FIRST,TADD      ;else skip string
0442 C70202007E    DW      TPUSH,2,TADD    ;and pointer
0448 F5022F04      DW      JUMP,SEARCH-1   ;and try next entry

044C D702          FAIL  DW      TPOP       ;drop dictionary pointer
044E 6C03          DW      ZERO           ;leave a zero on the stack
0450 5B02          DW      TRET           ;and quit

0452 DD02D702      SUCCEED DW      SWAP,TPOP ;drop string pointer
0456 C1077E02AB    DW      FIRST,TADD,PEEKW ;get code pointer
045C 7403          DW      NEGONE         ;push a minus one
045E 5B02          DW      TRET           ;and return
                        PAGE

```

Listing 2b. The dictionary lookup routine.

were typed into itself. Listing 1b shows what it would be compiled into and how it is actually written in the assembly-language kernel of the interpreter.

In order to let us use the LOOKUP function written for the interpreter, a small modification needs to be made to it. This change makes the beginning of the dictionary a parameter of the LOOKUP routine. The interpreter has to be changed to provide this parameter on the stack. Listing 2 highlights these changes. Since each section of the dictionary ends with a zero byte, the LOOKUP function will not run on beyond the end of the interpreter's section of the dictionary into the compiler's section.

Listing 3 contains the function ENTER, which stores a string into the interpreter's dictionary. It assumes that the code address for the dictionary entry is the current end of the code section of the dictionary because that is where the next compiled definition will go. Notice that the two halves of the dictionary—the names section and the code section—are allowed to grow toward each other until they meet just as described in the interpreter article; testing for this collision is performed both in ENTER and in the routine for adding code to the code section of the dictionary.

Implementation: The Semicolon

The semicolon is in FORTH what the END statement is in BASIC; it tells the compiler that the subroutine definition is finished. The actions taken by ";" (Listing 4) are: 1) a threaded code return (TRET) is stored at the end of the code being compiled, and 2) a flag is set, causing the compiler to exit its main loop.

Implementation: IF-ELSE-THEN

The IF statement is a conditional forward GOTO. When an IF statement is compiled, it stores a conditional jump-if-zero (i.e., *skip this code if false*) instruction (a threaded code jump instruction, not a machine-language instruction) but leaves the address to be jumped to as a zero temporarily. *The address of the word which contains this zero (the second half of the jump instruction) is pushed onto the stack so that it can be used later.* Listing 5 contains all of the code for the IF, THEN and ELSE statements. It is written in threaded code.

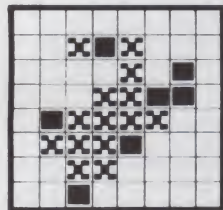
The THEN statement serves as a target for the forward jump left by the IF. The compiler routine for

Proven Favorites...

These 10 Popular Games Offer Exciting New Challenges

Here are 10 games that have never lost popularity. They've been played in many forms for many years. And now they're among the favorite software packages in the computerized home-entertainment field.

Don't miss out on the excitement, challenge and downright fun of these programs. Take the word of thousands of satisfied players. They're still tops. Order yours today and play your kind of game.

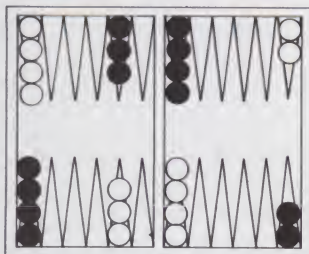


TRS-80*

OTHELLO

OTHELLO—Pit your strategic powers against a merciless, computerized opponent. You play on a board of 64 squares. When you capture your opponent's game disks (by bracketing them with your own disks), they immediately change sides to become members of your set. You can capture several game pieces at one time as long as they are in-line horizontally, vertically or diagonally. Major reversals of score are commonplace as whole blocks of men change side in an instant. (T1) Order No. 0046R \$9.95

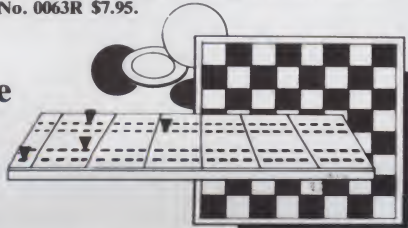
Beginner's Backgammon and Keno



BEGINNER'S BACKGAMMON/KENO—Why sit alone when you can play these fascinating games: ● **BACKGAMMON**: Play against the computer in a game that's sure to sharpen your skills; ● **KENO**: Enjoy this popular Las Vegas gambling game—guess the right numbers and win big! (T1) Order No. 0004R \$7.95.

CARDS—A one-player package to let you play, with your computer, these famous games: ● **DRAW AND STUD POKER**: These programs will keep your game sharp; ● **NO-TRUMP BRIDGE**: Develop your strategy and (hopefully) increase your skill. (T1) Order No. 0063R \$7.95.

Your Cribbage and Checkers Partner



YOUR CRIBBAGE AND CHECKERS PARTNER—● **CRIBBAGE** is a two-person game that you are sure to enjoy. This is NOT a tutorial—it is a game worthy adversary. ● **CHECKERS**: An old favorite which follows international rules, including multiple jumps. (T1) Order No. 0068R \$9.95.

(T1)=TRS-80 Model 1, Level II, 16K RAM

Instant Software™

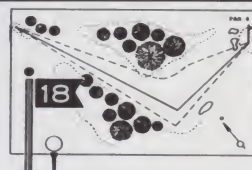
PETERBOROUGH, N.H. 03458 603-924-7296

CHESSMATE-80—This versatile chess opponent gives you a choice of ten levels of play, from the "blitz" level (the computer has 3 seconds to move) to the infinity level (where the computer will consider every possible move—which could take years). This machine-language program is a conservative player and follows all the rules of international play. **CHESSMATE-80** can teach you how to move and allow you to set up the board and play end games or special problems. **CHESSMATE-80** battled Sargon II to a draw at two minutes a move and beat Microchess 1.5 in six moves. (T1) Order No. 0057R \$19.95.

BOWLING—Let your TRS-80 set up the pins and keep score. One player can pick up spares and get strikes. (T1) Order No. 0033R \$7.95.

Apple**

GOLF



GOLF—Without leaving the comfort of your living room you can enjoy a challenging 18 holes of golf with a complete choice of clubs and shooting angles. Now, you need never cancel your game because of rain. One or two players can enjoy this game on your Apple II with Applesoft and 32K. Order No. 0018A \$7.95

PET***

CASINO I—Gamblers, gather round for: ● **BLACKJACK**—a fun-to-play and tutorial version that allows you to play every combination that they play at the MGM Grand Hotel in Las Vegas; ● **ROULETTE**—also a game and a tutorial which could enable you to develop the skill to make a fortune at the tables. Order No. 0014P \$7.95

CASINO II—This is not simply a craps game, it is a tutorial program that will teach you the odds on every type of bet, so you can steer clear of the sucker bets that impoverish the unwary. Using the exact rules used at the MGM Grand Hotel in Las Vegas, you'll play under actual gambling house conditions. Get the edge you need to "get lucky." Order No. 0015P \$7.95

CHECKERS & BACCARAT—Using International Rules, you'll play ● **CHECKERS** with your computer and the computer will keep score, time the moves and even tell you when to jump (it'll be so busy, you may have an edge!); ● **BACCARAT**—gives you the choice of playing Las Vegas or Blackjack style and the computer will deal the cards, figure the payoff and keep track of your bankroll. Order No. 0022P \$7.95

ORDER YOUR INSTANT SOFTWARE TODAY!

Just Call Toll-Free 1-800-258-5473

* A trademark of Tandy Corporation

** A trademark of Apple Computer Inc.

*** A trademark of Commodore Business Machines Inc.


```

; ENTER - enter a name in the dictionary
; ENTRY: TOP - pointer to name
; EXIT: No Values Returned
; DESCRIPTION: Moves the name up to the name section of
; the interpreter's dictionary. Produces an error
; if there is no room.
055C 4702 ENTER DW TCALL ;threaded code
055E 6404AB02 DW CODE,PEEKW ;store code address for
0562 6004AB02 DW NAMES,PEEKW ;new dictionary entry
0566 76027602BD DW DEC,DEC,POKEW ;(in word below current name point
056C E502A102 DW DUP,PEEKW ;get the string length
0570 E5026E026E DW DUP,INC,INC,INC ;add 3 giving entry length
0578 6004AB02 DW NAMES,PEEKW ;subtract from current beginning
057C DD029902 DW SWAP,TSUB ;of NAMES giving new beginning
0580 E5026404AB DW DUP,CODE,PEEKW ;compare with CODE
0586 DD02330399 DW SWAP,IFGT,EERROR-1 ;if memory full, then error
058C E5026004BD DW DUP,NAMES,POKEW ;else store new beginning
0592 DD026E02F7 DW SWAP,INC,MVBYTES ;and move string to it
0598 5B02 DW TRET

059A C702A205 EERROR DW TPUSH,EEMSG ;print bad news
059E D905 DW ERROR
05A0 5B02 DW TRET

05A2 0F44696374EEMSG DB 15,'Dictionary Full',0DH
PAGE

```

Listing 3. Enter a name in the dictionary.

```

; SEMI - the semicolon - end compilation
; DESCRIPTION: compiles a threaded code return and sets
; the compiler flag to -1.
06A3 4702 SEMI DW TCALL ;threaded code
06A5 C7025B02B3 DW TPUSH,TRET,CPLW ;compile a TRET
06AB 74034703BD DW NEGONE,CFLAG,POKEW ;signal end of compilation
06B1 5B02 DW TRET
PAGE

```

Listing 4. Code for the semicolon.

```

; Compiler Vocabulary

; IF - skip code if false
; EXIT: TOP - address of middle of jump instruction
; DESCRIPTION: compiles a jump-if-zero saving
; the address of the destination address on the
; stack.
060D 4702 IFX DW TCALL ;threaded code
060F C7020503B3 DW TPUSH,IFZ,CPLW ;compile conditional jump
0615 6404AB02 DW CODE,PEEKW ;save next address
0619 6C03B305 DW ZERO,CPLW ;compile a zero temporarily
061D 5B02 DW TRET

; THEN - target for IF and ELSE jumps
; ENTRY: TOP - Address of second half of jump
; instruction to be modified
; DESCRIPTION: stores the address of the next code
; word to be compiled in the jump instruction addressed
; by the top of the stack.
061F 4702 THEN DW TCALL ;threaded code
0621 6404AB0276 DW CODE,PEEKW,DEC ;get next CODE address
0627 DD02BD02 DW SWAP,POKEW ;store in jump instruction
062B 5B02 DW TRET

; ELSE - unconditional skip to THEN; target for IF jumps
; ENTRY: TOP - Address of second half of jump
; instruction to be modified.
; EXIT: TOP - Address of second half of jump
; instruction to be modified (new jump)
; DESCRIPTION: compiles and unconditional jump saving
; the address of the destination address on the stack.
; Stores the address of the next code word to be compiled
; in the jump instruction addressed by the top of the stack.
062D 4702 ELSEX DW TCALL ;threaded code
062F C702F502B3 DW TPUSH,JUMP,CPLW ;compile unconditional jump
0635 6404AB02 DW CODE,PEEKW ;save address of next word
0639 6C03B305 DW ZERO,CPLW ;compile a zero temporarily
063D DD02 DW SWAP ;get address of IF jump
063F 6404AB0276 DW CODE,PEEKW,DEC ;get next CODE address
0645 DD02BD02 DW SWAP,POKEW ;store in IF jump
0649 5B02 DW TRET
PAGE

```

Listing 5. Compiler vocabulary.

THEN does not compile any new code, but instead uses the address left on the stack by IF to complete the forward jump by storing there the address of the next word of code to be compiled.

The ELSE statement uses a combination of the IF code and the THEN code. It completes the IF's forward jump in the same way as the THEN statement—so that when an ELSE is present, IF only jumps as far as the ELSE and not all the way to the THEN. However, in order to make the "true" code skip over the "false" code, ELSE also compiles an unconditional jump and leaves the address of the second word of the jump on the stack. In this way, the IF and the ELSE leave identical stack conditions, and the THEN doesn't have to worry about whether the optional ELSE appeared or not.

Implementation: REPEAT - UNTIL - LOOP

The conditional looping routines work in almost the same way as the IF-ELSE-THEN routines. The REPEAT statement is only a target for a backwards jump from the LOOP statement. It doesn't compile any code, but simply leaves the address of the next word to be compiled on the stack. The UNTIL statement, which is not optional, compiles a conditional jump-if-not-zero and, like the IF statement, leaves the address to jump to as zero and the address of the second half of the jump on the stack.

When the LOOP statement is executed, there are two words on the stack: the address of the second half of the forward jump (left by UNTIL) and the address of the beginning of the loop (left by REPEAT). The LOOP routine compiles an unconditional jump back to the REPEAT statement and completes the forward jump of the UNTIL statement so that it jumps past the LOOP. This code is shown in Listing 6.

The use of the stack to store jump addresses is all done during compilation and has no effect on parameter passing at run time. It allows nesting of the IF-THEN, REPEAT and FOR constructions to a depth which is limited only by the size of the parameter stack and will work fine as long as each statement is balanced and properly constructed. As mentioned earlier, syntax errors will not cause compiler errors but will result in the generation of bad code as, for example, the THEN statement completing a


```

; REPEAT - target for LOOP instruction
; EXIT: TOP - address of end of CODE
; DESCRIPTION: simply leaves address of next CODE
; instruction on the stack.

064B 4702 REPEAT DW TCALL ;threaded code
064D 6404AB0276 DW CODE,PEEKW,DEC ;get CODE address
0653 5B02 DW TRET

; UNTIL - terminate LOOP if true
; EXIT: TOP - address of middle of jump instruction
; to be filled in by LOOP.
; DESCRIPTION: Compiles a conditional jump-if-not-zero
; leaving the address of the destination address on the stack
; to be filled in by the LOOP instruction.

0655 4702 UNTIL DW TCALL ;threaded code
0657 C7021803B3 DW TPUSH,IFNZ,CMLW ;compile conditional jump
065D 6404AB02 DW CODE,PEEKW ;save address of next word
0661 6C03B305 DW ZERO,CMLW ;compile a zero temporarily
0665 5B02 DW TRET

; LOOP - target for UNTIL; unconditional return to REPEAT
; ENTRY: TOP - address of UNTIL jump
; TOP-1 - address of REPEAT location
; DESCRIPTION: compiles an unconditional jump to the
; location of the REPEAT word; points the UNTIL jump
; to the next CODE word to be compiled.

0667 4702 LOOP DW TCALL ;threaded code
0669 C702F502B3 DW TPUSH,JUMP,CMLW ;compile unconditional jump
066F DD02B305 DW SWAP,CMLW ;to repeat
0673 6404AB0276 DW CODE,PEEKW,DEC ;get next CODE word
0679 DD02BD02 DW SWAP,POKEW ;and complete UNTIL jump
067D 5B02 DW TRET
PAGE

```

Listing 6. REPEAT—target for LOOP instruction.

jump set up by an UNTIL, or some similar confusion.

Implementation: FOR-LOOP

As mentioned before, to keep the

FOR and LOOP code simple, we introduce two new primitive instructions into the threaded code interpreter: the initialize FOR loop instruction (FORINIT) and the incre-

ment and test instruction (FORTEST). Both of these use a new interpreter stack (recall that we already have two: the parameter stack and the return address stack), the LOOP stack (Listing 7). It is implemented in the same way as the return stack (the stack pointer is kept in memory) and is used to store the current and final values of the loop variable.

FORINIT, since it is simple and only executed once for each use of the FOR LOOP, is written in threaded code (Listing 8). It pushes onto the loop stack one less than the starting value of the index variable (so that the first increment and test instruction will bump it to its proper starting value) and one more than the final value of the loop variable (so that the test for termination is a test for equality rather than a greater than test).

FORTEST is written in machine code so that it will execute quickly. It pops the two numbers off of the loop stack, increments the index variable and compares it to the terminating value. If they are equal, it leaves a nonzero quantity on the stack; if they are not equal, it pushes both values

```

; LPUSHX - push top of stack on loop stack
; ENTRY: DE - number to go to loop stack
; EXIT: No Values Returned
; DESCRIPTION: Pushes DE on the loop stack.

0734 2A5307 LPUSHX LHLD LSTACK ;get stack pointer
0737 73 MOV M,E ;store low byte
0738 23 INX H ;bump stack pointer
0739 72 MOV M,D ;store high byte
073A 23 INX H ;bump stack pointer
073B 225307 SHLD LSTACK ;restore pointer
073E C9 RET

; LPUSH - push top of stack on loop stack
; DESCRIPTION: This is the threaded code callable
; version of LPUSHX.

073F 4107 LPUSH DW S+2 ;machine code
0741 D1 POP D ;get value
0742 CD3407 CALL LPUSHX ;push it
0745 C33702 JMP NEXT

; LPOPX - pop loop stack
; ENTRY: No Values Expected
; EXIT: DE - former top of loop stack
; DESCRIPTION: Pops loop stack to DE

0748 2A5307 LPOPX LHLD LSTACK ;get stack pointer
074B 2B DCX H ;dec to hi byte
074C 56 MOV D,M ;retrieve
074D 2B DCX H ;dec to low byte
074E 5E MOV E,M ;retrieve
074F 225307 SHLD LSTACK ;restore stack pointer
0752 C9 RET

; LSTACK - the loop stack
; DESCRIPTION: Implemented in the same way as the return stack.
; The stack pointer points to the next available location.

0753 5507 LSTACK DW S+2
0755 DS 64 ;good for 16 levels of nested loops
PAGE

```

Listing 7. LPUSHX—push top of stack on loop stack.

TRS-80*

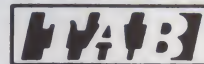
SAVE A BUNDLE

When you buy your
TRS-80™ equipment!

Use our toll free number to
check our price before you buy
a TRS-80™ . . . anywhere!

TRS-80 is a trademark of the Radio Shack Division of Tandy Corporation

full RadioShack warranty



✓ 189

SALES COMPANY

1412 WEST FAIRFIELD DR.

P.O. BOX 8098 PENSACOLA FL 32505

904/438-6507

nationwide 1-800-874-1551


```

- : CONSTANT
    GETWORD ENTER      read the next word and enter it into the dic-
                        tionary
    CONS      CMPLW      compile a pointer to CONSTANT code and
                        CMPLW ;      compile the constant's value
0
- : VARIABLE
    GETWORD ENTER      read the next word and enter it
    VARBL      CMPLW      compile pointer to VARIABLE code
                        CMPLW;      and compile initial value
0
- 10 CONSTANT TEN      define TEN to be the constant 10
0
- TEN
10
- TEN TEN +
20
- 13 VARIABLE UNLUCKY      define UNLUCKY to be a variable with the ini-
20                          tial value 13
- UNLUCKY                  variables return their addresses
2433
- UNLUCKY PEEKW            you have to "peek" their values
13
- 7 UNLUCKY POKEW          and "poke" changes to them
13
- UNLUCKY PEEKW
7
- : ? PEEKW ;              of course you don't have to be verbose about it
7
- UNLUCKY ?
7
-

```

Table 8. CONSTANTS and VARIABLES.

back on the loop stack and leaves a zero on the stack.

These two primitives make the compilation of the FOR LOOP quite simple. FOR compiles a call to FOR-INIT and a call to FORTEST, leaving the address of the FORTEST instruction on the stack to serve as a target for the jump from LOOP. It also compiles a jump-if-not-zero after the FORTEST and leaves the address of the second half of the jump on the stack (Listing 9).

Notice that the stack conditions left by FOR are the same as those left by REPEAT and UNTIL. Therefore, the same LOOP code can be used for both loops. LOOP compiles an unconditional jump back to the FOR-TEST instruction and completes the forward jump which follows it with the address of the word to be compiled after LOOP.

Implementation: I, J and K

The instructions which access the current value of the index variable of the FOR LOOP are not compiler instructions. They are regular threaded-code instructions which access the contents of the loop stack; the compiler simply compiles their address. Listing 10 shows their definitions. Notice that they access every other word on the loop stack, skipping the terminating values. It should be clear how to add more of these words if they are needed.

Implementation: CONSTANTS and VARIABLES

The interpreter article introduced a trick for implementing variables and constants in a threaded language; you create an entry with a special type of function which either loads a constant onto the stack or loads the address of a variable. Since, while typing new programs into the compiler, you will probably want to introduce new variables and constants, you need a way to enter these definitions for them.

One method is to provide the

THE SPIKE-SPIKERS™

with Transient Absorber and R.F. Filters
Protects Computers & Sensitive Equipment
from Most Transients & "Hash" Interference



Deluxe Power Console
with Transient Absorber & RF Filters
8 individually switched 120 Vac.
Grounded outlets. Divided into two filtered
circuits. Main on/off switch.
Fuse and Indicator Light
\$79.95



Mini-I
Wall mounted with
Transient Absorber
Only
\$34.95

Mini-II
Two Sockets with
Transient Absorber
plus RF "Hash"
Filters
\$44.95

Prices Subject to Change without Notice - PA Residents add 6% sales tax

KALLO ELECTRONICS CO., INC.
DEPT. MC 222
COLONY DRIVE INDUSTRIAL PARK
6584 RUCH ROAD - E. ALLEN TWP.
BETHLEHEM, PA 18017



dealers invited

ORDER FACTORY DIRECT
215-865-0006
OUT OF STATE ORDER TOLL FREE
800-523-9685

TRS-80 & OTHER NEEDS FILLED FOR LESS

- +++ COMPATIBLE DISK DRIVES WITH POWER SUPPLY AND CASE—120 DAY WARRANTY +++
- 40 TRACK (204,800 BYTE/DISK) USE BOTH SIDES, ANTI-CRIMP/POWER PROTECT **\$319**
- 8 IN. DRIVE & P.S./CASE **\$729** WITH P.S./CASE FOR 3 DRIVES **\$929**
- 80 TRACK (204.8K BYTE) 90 DAY WARRANTY **\$419**
- 4-DRIVE CABLE **\$28** • 10 DISKS-5 IN. @ **\$24**-8 IN. @ **\$36** HARD CASE **\$3 & 5**
- BASE 2 PRINTER **\$599** EPSON MX-80 PRINTER **\$499** MICROLINE 80 PRINTER **\$499**
- CENTRONICS 737 **\$699** + + + + + CABLE @ **\$25**
- HARRIS SELECTRIC (WORD PROCESSING-TYPEWRITER & PRINTER) **\$790**
- LOWER CASE FOR CENTRONICS 779/RADIO SHACK LINE PRINTER 1-EASY INSTALL **\$99.95**
- UPS (UNINTERRUPTIBLE POWER SUPPLY) PREVENT POWER DROP SURGE OR OUT? FROM **\$195**
- CAT MODEM (ORIG/ANS) **\$139** + + + + + 16K MEMORY SET (200 NANO) **\$34**
- 16K MODEL III RADIO SHACK SYSTEM **\$849**
- APPLE, ATARI, RADIO SHACK MODEL 1/2 HARDWARE/SOFTWARE DISCOUNTED. A/R, A/P, G/L, P/R FOR **\$200 or \$59 ea.** (MODEL 1) & **\$329 or \$80 ea.** (MODEL 2). APPLICATIONS INTERACT & ARE COMPLETE & PROFESSIONAL. WILL RUN ON OTHER COMPUTERS. THIS IS A SPECIAL INTRODUCTORY PRICE.
- ASK FOR FREE FLYER WITH OUR LOW PRICES—DEALER INQUIRIES INVITED MASS. RESIDENTS ADD 5% TAX—F.O.B. TEWKSBURY—FREIGHT EXTRA.
- M/C, VISA OR CHECK ACCEPTED. TRS-80 IS A REG. TRADEMARK OF TANDY CORP.

OMNITEK SYSTEMS — 24 MARCIA JEAN DR., DEPT-M, TEWKSBURY, MA 01876 CALL 617-851-3156

Kilobaud Microcomputing will feature a special word processing issue in May. Manufacturers of word processing software for any microcomputer who want to be included in this issue should contact the Microcomputing editorial department immediately. Please send spec sheets of your software system. We will contact you if we need additional information.



P.O. Box 16020
Fort Worth, Texas
76133
(817) 294-2510

M-530

NEW VERSATILITY

For Your TRS-80



**CONTROL PROGRAM
FOR MICROCOMPUTERS
ENABLING YOU TO RUN
SOFTWARE PUBLISHED
FOR CP/M 1.4 ON THE
TRS-80**

CP/M is considered the industry standard disk operating system because it gives you the hardware-independent interface you need to make your computer work for you. CP/M 2.0 is the latest in the evolution of a proven reliable and efficient software system. FMG CORPORATION NOW OFFERS THE CP/M 2.0 FOR THE TRS-80.

It features an enhanced upward compatible file system and powerful new random access capabilities. The CP/M 2.0 from FMG provides the ability to run software published for the CP/M system, on the TRS-80 Model II. From minidisks, floppy disks, all the way to high-capacity hard disks, the flexibility of CP/M 2.0 makes it a truly universal operating system. The package includes an 8" system disk, editor, assembler and debugger for the TRS-80

Available in Format A, B, C, G only \$200/\$25



MULTI-PROGRAMMING MONITOR

NEW INDUSTRY STANDARD

A deluxe operating system that provides big computer facilities at small computer prices. MP/M is a monitor program which operates with your microcomputer to provide multi-terminal access with multi-programming at each terminal. Best of all, it's CP/M compatible which means you can run a wide variety of programming languages, applications packages, and development software.

You can run simultaneous editors, program translators, and background printer spoolers. Or you can use MP/M for data entry or data-base access from remote terminals. Or you can use MP/M real-time features to monitor an assembly line and automatically schedule programs for execution throughout the day. MP/M makes an excellent focal point for a cluster of connected microcomputers. The possibilities are limitless.

(Format B) \$450/\$35
(Format G) \$300/\$35

*CP/M and MP/M are trademarks of Digital Research. 290 is a trademark of Zilog, Inc. TRS-80 is a trademark of Tandy Corp. Pascal/M is a trademark of Sorcim.



MICROPRO INTERNATIONAL
SUPER-SORT I - Sort, merge, extract utility as absolute executable program or linkable module in Microsoft format. Sorts fixed or variable records with data in binary, BCD, Packed Decimal, EBCDIC, ASCII, floating & fixed point, exponential, field justified, etc. Even variable number of fields per record! \$225/\$25

SUPER-SORT II - Above available as absolute program only \$175/\$25

SUPER-SORT III - As I without SELECT/EXCLUDE \$125/\$25

WORD-STAR - Menu driven visual word processing system for use with standard terminals. Text formatting performed on screen. Facilities for text pagination, page number, justify center and underscore. User can print one document while simultaneously editing a second. Edit facilities include global search and replace, Read/Write to other text files, block move, etc. Requires CRT terminal with addressable cursor positioning. \$495/\$40

WORD-STAR Customization Notes - For sophisticated users who do not have one of the many standard terminal or printer configurations in the distribution version of WORD-STAR. \$125/\$25

WORD-MASTER Text Editor - In one mode has super-set of CP/M's ED commands including global searching and replacing, forwards and backwards in file. In video mode, provides full screen editor for users with serial addressable-cursor terminal. \$150/\$25

FLOPPY SAVER - Protection for center holes of 5" and 8" floppy disks. Only 1 needed per diskette. Kit contains centering post, pressure tool and tough 7 mil mylar reinforcing rings for 25 diskettes.

5" Kit \$14.95
8" Kit \$18.95
5", Rings only \$7.95
8", Rings only \$8.95

HEAD CLEANING DISKETTE - Cleans the drive Read/Write head in 30 seconds. Diskette absorbs loose oxide particles, fingerprints, and other foreign particles that might hinder the performance of the drive head. Lasts at least 3 months with daily use.

8" \$32.00
5 1/4" \$30.00

DESPOL - Allows flexibility and efficiency. (Disk file printing can be accomplished while simultaneously using the computer for other tasks). Slower printers do not tie up the computer. Requires 32K minimum. \$75/\$10

SCREEN EDIT - Text editor for program entries - allows user the ability to see entries as they are being made. Has command which enables user to move the viewed position of the file anywhere within the current data file OR add information anywhere in the file. Requires 16K minimum. \$125/\$25
(Also available in TRS DOS format. Specify model or TRS-80)

MAC - Disk-based, powerful macro assembler utilizes Standard Intel Mnemonics. Includes macro processor.

The CP/M 8080 Macro Assembler reads assembly language statements from a diskette file and produces an Intel "HEX" format object file on the disk suitable for processing in the TRS-CP/M environment. Requires 32K minimum and CP/M. \$100/\$25

ZSID - Efficient and reliable program testing system for 280 microcomputers. Capabilities include traceback and histogram facilities. Allows real time break points. ZSID is a symbolic debugger which expands upon the features of the TRS-CP/M standard debugger, providing greater enhanced facilities for assembly language program check-out. Requires 32K minimum and CP/M. \$99/\$25

FMG's LIBRARY:

PASCAL USER MANUAL & REPORT

(2nd Edition) by K. Jensen and N. Wirth

Tutorial Manual and Concise Reference Report for Both Programmers and Implementors
Includes Helpful Examples to Demonstrate the Various Features of PASCAL
The book consists of two parts: the user manual and the revised report. The manual is directed to those who have some familiarity with computer programming and who wish to get acquainted with the PASCAL language. The report defines standard PASCAL, which constitutes a common base between various implementations of the language

Stock No. #821 Price \$9.95

PASCAL PRIMER Problem Solving

This book has three major goals:
- To introduce all aspects of the programming and problem solving process (includes problem specification and organization, algorithms, coding, debugging, testing, documentation and maintenance);
- To teach good programming style and how to produce a high quality finished product; and
- To teach the syntax of the PASCAL programming language.
Numerous examples are employed throughout the text. PASCAL is used as a vehicle to teach various aspects of programming techniques

Stock No. #824 Price \$19.95

PEACHTREE SOFTWARE SYSTEMS

GENERAL LEDGER - Records details of all financial transactions. Generates a balance sheet and an income statement. Flexible and adaptable design for both small businesses and firms performing client wide services. Produces reports as follows: Trial Balance, Transaction Register, Balance Sheet, Prior Year Comparative Balance Sheet, Income Statement, Prior Year Comparative Income Statement and Department Income Statement. Interactive with other PEACHTREE accounting packages. Supplied in source code for Microsoft BASIC. \$990/\$60

ACCOUNTS PAYABLE - Tracks current and aged payables and incorporates a check writing feature. Maintains a complete vendor file with information on purchase orders and discount terms as well as active account status. Produces reports as follows: Open Voucher Report, Accounts Payable Aging Report, and Cash Requirements. Provides input to PEACHTREE General Ledger. Supplied in source code for Microsoft BASIC. \$990/\$60

ACCOUNTS RECEIVABLE - Generates invoice register and complete monthly statements. Tracks current and aged receivables. Maintains customer file including credit information and account status. The current status of any customer account is instantly available. Produces reports as follows: Aged Accounts Receivable, Invoice Register, Payment and Adjustment Register and Customer Account Status Report. Provides input to PEACHTREE General Ledger. Supplied in source code for Microsoft BASIC. \$990/\$60

PAYROLL - Prepares payroll for hourly, salaried and commissioned employees. Generates monthly, quarterly and annual reports. Prepares employee W-2's. Includes tables for federal withholding and FICA as well as withholding for all 50 states plus up to 20 cities from pre-computed or user generated tables. Will print checks, Payroll Register, Monthly Summary and Unemployment Tax Report. Provides input to PEACHTREE General Ledger. Supplied in source code for Microsoft BASIC. \$1,190/\$60

INVENTORY - Maintains detailed information on each inventory item including part number, description, measure, vendor and reorder data, item activity and complete information on current item costs, pricing and sales. Produces reports as follows: Physical Inventory Worksheet, Inventory Price List, Departmental Summary Report, Inventory Status Report, the Reorder Report and the Period-to-Date and Year-to-Date reports. Supplied in source code for Microsoft BASIC. \$1,190/\$60

MAILING ADDRESS - Keeps track of name and address information and allows the selective printing of this information in the form of mailing lists or address labels. Allows the user to tailor the system to his own particular requirements. User-defined format and print-out system uses a special format file which tells programs how to print the mailing list or address labels. Standard format files are included with system. Automatic sorting of data uses indexed file management routines which allow the name and address information to be sequentially retrieved and printed without file sorting. Supplied in source code for Microsoft BASIC. \$790/\$60

GRAHAM-DORIAN SOFTWARE SYSTEMS

GENERAL LEDGER - An on-line system; no batching is required. Entries to other GRAHAM-DORIAN accounting packages are automatically posted. User enters customized G.O.A. Provides transaction register, record of journal entries, trial balances and monthly closings. Keeps 14 month history and provides comparison of current year to prior years. Requires CBASIC-2. Supplied in source. \$995/\$35

ACCOUNTS PAYABLE - Maintains vendor list and check register. Performs cash flow analysis. Flexible system for managing accounts payable. Can be used to make partial payments. Automatically posts to GRAHAM-DORIAN General Ledger or runs as stand alone system. Requires CBASIC-2. Supplied in source. \$995/\$35

ACCOUNTS RECEIVABLE - Creates trial balance reports, prepares statements, ages accounts and records invoices. Provides complete information describing customer payment activity. Receipts can be posted to different ledger accounts. Entries automatically update GRAHAM-DORIAN General Ledger or runs as stand alone system. Requires CBASIC-2. Supplied in source. \$995/\$35

PAYROLL SYSTEM - Maintains employee master file. Computes payroll withholding for FICA, Federal and State taxes. Prints payroll register, checks, quarterly reports and W-2 forms. Can generate ad hoc reports and employee form letters with mail labels. Requires CBASIC-2. Supplied in source. \$990/\$35

INVENTORY SYSTEM - Captures stock levels, costs, sources, sales, ages, turnover, markup, etc. Transaction information may be entered for reporting by salesman, type of sale, date of sale, etc. Reports available both for accounting and decision making. Requires CBASIC-2. Supplied in source. \$990/\$35

JOB COSTING - Designed for general contractors. To be used interactively with other GRAHAM-DORIAN accounting packages for tracking and analyzing expenses. User establishes customized cost categories and job phases. Reports are generated from actual versus estimated costs. Automatically updates GRAHAM-DORIAN General Ledger or runs as stand alone system. Requires CBASIC-2. Supplied in source. \$995/\$35

Sample Program Disk For Each Graham-Dorian Business Package. Specify Package. \$45

The sale of each proprietary software package conveys a license for use on one system only. Prices F.O.B. Fort Worth, Tex. Shipping, handling and C.O.D. charges extra.

Microcomputer Problem Solving Using Pascal

by Kenneth L. Bowles

A Book Designed for Both College Courses AND Individual Self-Study
Ideal for use with UCSD PASCAL
Includes Extensions to Standard PASCAL
This book is designed both for introductory courses in computer problem solving at the freshman and sophomore college level, and for individual self-study. It includes many examples and actually executable programs. It includes information on the necessary functions and procedures for handling graphics and strings

Stock No. #822 Price \$14.95

BEGINNER'S MANUAL FOR UCSD PASCAL SYSTEM

An Enlightening Introduction to UCSD PASCAL
Demonstrates How to Use the UCSD PASCAL System and How to Program in PASCAL
Includes Many Practical Examples of PASCAL Programs
This book is intended to be used as an introduction and reference manual for people just beginning to use the UCSD PASCAL System. Whether you have never used a computer before or whether you are an experienced programmer who is unfamiliar with UCSD PASCAL, this book will provide a relatively easy yet thorough introduction to UCSD PASCAL

Stock No. #825 Price \$11.95

MICROSOFT PRODUCTS

BASIC-80 - Disk Extended BASIC, ANSI compatible with long variable names, WHILE/WEND, chaining, variable length file records. \$350/\$25
BASIC COMPILER - Language compatible with BASIC-80 and 3-10 times faster execution. Produces standard Microsoft relocatable binary output. Includes MACRO-80. Also linkable to FORTRAN-80 or COBOL-80 code modules. \$395/\$25

FORTAN-80 - ANSI 66 (except for COMPLEX) plus many extensions. Includes relocatable object compiler, linking loader, library with manager. Also includes MACRO-80 (see below). \$500/\$25

COBOL-80 - Level 1 ANSI 74 standard COBOL plus most of Level 2. Full sequential, relative, and indexed file support with variable file names. STRING, UNSTRING, COMPUTE, VARYING/UNTIL, EXTEND, CALL, COPY, SEARCH, 3-dimensional arrays, compound and abbreviated conditions, nested IF. Powerful interactive screen-handling extensions. Includes compatible assembler, linking loader, and relocatable library manager as described under MACRO-80. \$750/\$25

MACRO-80 - 8080/280 Macro Assembler, Intel and 8085 mnemonics supported. Includes relocatable linker, loader, library manager and Cross Reference List utilities included. \$150/\$25

MACRO-86 - 8086 cross assembler. All Macro and utility features of MACRO-80 package. Mnemonics slightly modified from Intel 8086. Compatibility data sheet available. \$300/\$25

PASCAL/MT - Subset of standard PASCAL. Generates ROMable 8080 machine code. Symbolic debugger included. Supports interrupt procedures. CP/M file I/O and assembly language interface. Real variables can be BCD, software floating point, or AMD 9511 hardware floating point. Version 3 includes Enumeration and Record data types. Manual explains BASIC to PASCAL conversion. Source for the run-time package requires Digital Research's MAC. Requires 32K. \$250/\$30

CBASIC-2 Disk Extended BASIC - Non-interactive BASIC with pseudo-code compiler and run-time interpreter. Supports full file control, chaining, integer and extended precision variables, etc. \$110/\$15

BSTAM - Utility to link one computer to another also equipped with BSTAM. Allows file transfers at full data speed (no conversion to hex), with CRC block control check for very reliable error detection and automatic retry. We use it a great! Full wildcard expansion to send a COM, etc. 9600 baud with wire, 300 baud with phone connection. Both ends need one Standard and 8 versions can talk to one another. \$150/\$55

SELECTOR II-C2 - Data Base Processor to create and maintain multi Key data bases. Prints formatted sorted reports with numerical summaries or mailing labels. Comes with sample applications, including Sales Activity, Inventory, Payables, Receivables, Check Register, and Client/Patient Accounts. Requires CBASIC-2. Supplied in source. \$349/\$20

GLECTOR - General Ledger option to SELECTOR II-C2. Interactive system provides for customized COA. Unique chart of transaction types insure proper double entry bookkeeping. Generates balance sheets, P&L statements and journals. Two year record allows for statement of changes in financial position. Supplied in source. Requires SELECTOR II-C2, CBASIC-2 and 52K system. \$250/\$25

TEXTWRITER III - Text formatter to justify and paginate letters and other documents. Special features include insertion of text during execution from other disk files or console, permitting reference documents to be created from linked tagged documents. Files. Has facilities for sorted index, table of contents and footnote insertions. Ideal for contracts, manuals, etc. Now compatible with Electric Pencil! prepared by. \$125/\$20

FORMATS AVAILABLE:

(A) TRS-80 Model I (M) Keys Only
(B) TRS-80 Model II
(C) TRS-80 Model III (M) Keys Only
(D) HEATHKIT H89 (M) Keys Only
(E) NORTH STAR
(F) SUPER BRAIN QD
(G) STANDARD UNIMPLEMENTED

(M) Modified version available for use with CPM as implemented on Heath and TRS-80 Model I computers.

(T) For all (T) items listed above, the recommended system configuration consists of 48K CPM 2 full disk drives, 24 x 80 CRT and 132 column printer.

PROGRAMING IN PASCAL

by Peter Grogono

An Excellent Introduction to One of the Fastest Growing Programming Languages Today
Sections on Procedures and Files PLUS a Chapter on Dynamic Data Structures such as Trees and Linked Lists

The text is arranged as a tutorial, containing both examples and exercises to increase reader proficiency in PASCAL. Concepts are illustrated by examples, ranging from the Tower of Hanoi problem to circumscribing a circle about a triangle. PROGRAMING IN PASCAL is sure to hold the reader's interest

Stock No. #823 Price \$14.95

UCSD Reference Book

A Reference Guide to the Complete UCSD PASCAL System
Includes Information on Compiler, Basic, Assembler and Editor
Lists Actual P-Machine Codes

This reference book can be a valuable and time-saving guide to thorough information on the UCSD PASCAL System. The easy-to-read manual provides latest access to pertinent data

Stock No. #826 Price \$25.00

- 0 VARIABLE TEMP	define a temporary variable
0	
- : *	define a multiplication operator
DUP TEMP POKEW	- save the multiplicand
SWAP 2 FOR	- repeat the loop one less than the value of the multiplier times
TEMP PEEKW +	- just add the multiplicand to the running total
LOOP ;	NOTE: This is a very inefficient algorithm and is here just for fun
0	
- 10 10 *	test *
100	
- 3 4 *	
12	
- R	clear the stack
0	
- : FAC	an iterative definition of factorial
DUP EQZ IF	
POP 1	if argument is zero then value is 1
ELSE	
1 SWAP 1 FOR	else it is the product of all numbers
I *	
LOOP	between N and 1
THEN ;	
0	
- 6 FAC	test FAC
720	
- 0 FAC	
1	
- : FAC	factorial can be defined recursively
DUP EQZ IF	
POP 1	if argument is zero then value is 1
ELSE	else call
DUP DEC FAC	FAC with one less than the argument
*	and multiply result with argument
THEN ;	
1	
- 3 FAC	
6	

Table 9.

equivalent of compiler declarations for these new words. The word CONSTANT (Table 8) takes an argument from the top of the stack and reads the next word from the console and makes that word the name of a dictionary entry which points to a type CONSTANT function whose value is the number on the stack.

The word variable works in exactly the same way but compiles its entry as type VARIABLE. The number on the stack is the initial value of the VARIABLE.

Notice that the words CONSTANT and VARIABLE are not part of the assembly-language kernel; they are definitions typed into the compiler. Although they could just as easily have been put into the kernel, and it was necessary to define extra constants in the kernel (CONS and VARBL) that give the addresses of the CONSTANT and VARIABLE type code, I think they give an interesting illustration of what the compiler is capable of doing along these lines.

That's the whole compiler. Table 9 contains a few more examples of function definitions using CONSTANTS and VARIABLES, including some contrasting LOOPing and recursive definitions. Listing 11 contains all the loose end routines not defined earlier. Table 10 contains a glossary of all the words defined in the kernel. This is useful to maintain as you add words and write new definitions, since it helps to keep you from rewriting functions which already exist and makes it easier to use them as well.

Listing 8. FOR LOOP auxiliary definitions.

```

; FOR LOOP Auxiliary Definitions

; FORINIT - initialize a FOR LOOP
; ENTRY: TOP - starting value of loop index
;       TOP-1 - final value for loop index
; EXIT: No Values Returned
; DESCRIPTION: pushes the final value plus one
; and the starting value minus one onto the loop stack.

06DB 4702 FORINIT DW TCALL ;threaded code because not critical
06DD DD026E023F DW SWAP,INC,LPUSH ;final value
06E3 76023F07 DW DEC,LPUSH ;starting value
06E7 5B02 DW TRET

; FORTEST - increment and test FOR LOOP index variable
; ENTRY: No Values Expected
; EXIT: TOP - -1 if index variable has exceeded final value
;       TOP - 0 if index variable is still below final value
; DESCRIPTION: increments index variable (found on top of
; loop stack) and compares it with final value plus one (next
; number on loop stack). If equal, it leaves the values off
; of the loop stack and returns a -1 indicating termination of
; the loop otherwise it puts the values back on the loop stack
; and returns a zero.

06E9 EB06 FORTEST DW $+2 ;machine code for efficiency
06EB CD4807 CALL LPOPX ;get index variable
06EE 13 INX D ;and increment it
06EF D5 PUSH D ;get final value
06F0 CD4807 CALL LPOPX ;DE <- final value
06F3 E1 POP H ;HL <- index variable
06F4 E5 PUSH H
06F5 CD9102 CALL MINUSH ;subtract
06F8 19 DAD D

```

Extensions

I kept the code presented in these two articles as simple as possible to avoid complicating the explanations; as a result, it is far from perfect. Although it does run as described, it is lacking in a few respects, most notably error checking. Overstacking or overpopping the stacks will result in catastrophic failure of the system and unpredictable occurrences. If you make extensive use of this code, you will undoubtedly want to add as much of this kind of checking as you can. Additional necessary improvements include interfacing the code to your operating system or mass storage devices, so that you can store definitions on tape or floppy disk and load them when you want them.

Another useful feature is the ability to add comments to your definitions. FORTH defines the compiler word

More

Listing 8 continued.

```

06F9 7C      MOV    A,H
06FA B5      ORA    L
06FB CA0C07  JZ     ENDFOR ;if equal

06FE CD3407  CALL   LPUSHX ;else put final value back
0701 D1      POP    D ;and put index variable back
0702 CD3407  CALL   LPUSHX
0705 210000  LXI    H,0 ;return a zero
0708 E5      PUSH   H
0709 C33702  JMP     NEXT

070C E1      ENDFOR POP    H ;clear stack
070D 21FFFF  LXI    H,-1 ;return a minus one
0710 E5      PUSH   H
0711 C33702  JMP     NEXT
PAGE

```

"(' (a left parenthesis) to be "read and ignore everything until the next right parenthesis," which permits comments to appear anywhere. Another method is to choose a single character, for example, a percent sign, and define it to be READLINE. This causes everything after it on the line to be skipped over.

Other extensions include adding a third parameter to the FOR LOOP to

permit increments of the index variable other than one. You can do this directly or rewrite the code associated with FOR and make the increment an argument of the word LOOP (renamed to be distinct from the LOOP used with REPEAT). Words for performing more extensive reordering of the top three or four words on the stack are very useful (the use of the variable in the definition of the multi-

ply operation in Table 9 would not have been necessary with a few of these). More extensive primitives for output are not hard to add. There is really no end to what can be done with this type of code. ■

References

As mentioned in the beginning, this language is not FORTH. If you are interested in the real FORTH, or if you don't want to start your system from scratch, here are some useful sources:

- The FORTH Interest Group, PO Box 1105, San Carlos, CA 94070. These people sell a variety of FORTH literature and products including a source listing of a FORTH interpreter (for six popular CPUs) and an installation manual. They also publish a newsletter.

- "FORTH for Microcomputers," by John James, in *Dr. Dobb's Journal of Computer Calisthenics and Orthodontia*. Vol. 3, Issue 5. An introduction to standard FORTH including an explanation of how FORTH is usually interfaced to disks and CRT screens. A reprint is available from the FORTH Interest Group for \$2.

:	the compiler
+	add top to top-1
-	subtract top from top-1
/MOD	divide top-1 by top, leave quotient at top-1 and remainder at top
INC	add one to top
DEC	subtract one from top
MINUS	negate top
EQ	if top = top-1, replace it with -1, else replace it with 0
EQZ	if top = 0, replace it with -1, else replace it with 0
I	push innermost FOR loop index
J	push second FOR loop index
K	push third FOR loop index
CLEAR	pop all elements off of the stack
POP	pop the top element off of the stack
SWAP	swap top and top-1
DUP	duplicate the top element of the stack leaving it at both top and top-1
READLINE	read a line from the console into the console buffer
SCAN	extract a word from the console buffer, leave a pointer to it at top-1, with -1 at top, or just 0 if end of line
PEEKB	replace top with byte located at (top)
PEEKW	replace top with word located at (top)
POKEB	replace byte at (top) with top-1; drop top and top-1
POKEW	replace word at (top) with top-1; drop top and top-1
PRINTS	print the string pointed to by top
CONBXA	convert binary number at top to ASCII string; leave a pointer to the string
CONAXB	try to convert ASCII string pointed to by top to binary number; leave value and -1 if successful, 0 if not
MATCH	compare two strings pointed to by top and top-1; leave string pointers plus true if same, false if not
LOOKUP	lookup string in dictionary, leave pointer to entry and true if found, else pointer to string and false
ENTER	enter string in dictionary; causes error if dictionary overflows
CMPLW	enter 16-bit word into code section of dictionary; causes error if dictionary overflows
MVBYTES	move a block of (top) bytes from (top-2) to (top-1)
EXECUTE	execute routine located at (top)
MEMORY	variable, value = top of available memory
CONS	constant, value = address of CONSTANT code
VARBL	constant, value = address of VARIABLE code

Table 10. Glossary of interpreter words.



Turn your Micro into an electronic and security controller with our new... TRS-80 INTERFACE

To Order:
Send \$59.95 plus \$2.50 for shipping and handling
Illinois Residents add 6% tax

TRS-80 Software (Specify Tape or Disk) \$10 with purchase of Micro Commander

\$59.95 90 Day Warranty Assembled & Tested;

COMPUTER CONTROLLED - REMOTE CONTROL
Now an inexpensive and direct carrier current interface between the TRS-80 and the BSR X-10 remote control modules. The MICRO COMMANDER, X-10 modules and your computer can control your lights, appliances, motors, TV, stereo, heaters, alarms, fans, pumps, etc.

COMPUTER CONTROLLED - SECURITY
Add a new dimension to your security system. Place your home under control of your computer real time clock while you are on vacation. Add an input port to your computer and intelligence looms. With switches on doors or windows your computer can welcome guests or frighten intruders.

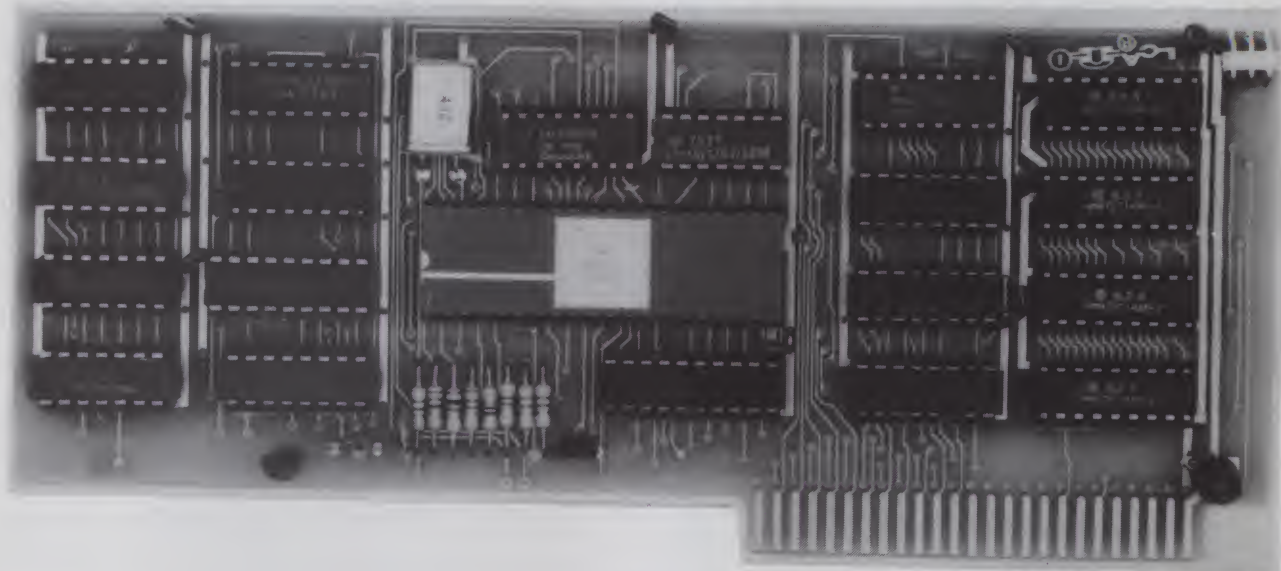
EASY TO USE - NO WIRES TO RUN
Total control of all X-10 modules. Utilize all 256 house and unit code combinations. Direct interface to AC power line. No command console to purchase. No sonic link. Plugs directly into TRS-80 Model I (Level II or Disk) cassette jack or any 1 bit input and 1 bit output TTL port.

MANUAL INCLUDES SOFTWARE LISTINGS
NEW "PORT C" Real time C-O-N-T-R-O-L software for all TRS-80 Mod. I (Level II or disk). Control your MICRO COMMANDER or output ports with respect to real time and/or input port triggers. Save schedules on tape or disk.

CONTACT US FOR BSR X-10 PRICES
INTERFACE TECHNOLOGY ✓ 183
P.O. Box 383, Des Plaines, IL 60017
Phone (312) 297-2265

FOR APPLE II AND APPLE II PLUS COMPUTERS

DoubleVisionTM



80 x 24 Video Display with Upper and Lower Case

COLUMNS LINES

• is a hardware board that may be plugged into any slot in Apple II or Apple II Plus 32K or 48K Disks • full 128 ASCII character set, including control characters • fully programmable cursor • built in light pen capability • inverse video • full cursor control • works with 50/60Hz • has 2k of its own screen memory • has its own video output jack that must be connected to a monitor (or a high band width black & white TV thru a good RF modulator). Color TV's produce a poor display and are not recommended. • permits you to connect another monitor (or a T.V. set thru RFmod) to the Apple video output jack • displays 24 lines of 80 column text — programmable for different values • permits you to have graphics on Apple video output • video output and Apple video output may be connected to one monitor thru optional video switch • is active only when addressed for reading from or writing to • accepts lower case input from keyboard by use of escape key. (no modification required) or direct use of shift key (1-wire connection from shift key pad to DoubleVision required). • is compatible with the latest version of various word processing software packages. Presently these include Apple-pie 2.0— Programma International, Easywriter Professional system—Informational Unlimited, Text Editor/Formatter—Peripheral's Unltd. (when ordering from these companies, please ask for versions compatible with DoubleVision). All software available from Computer Stop when released. • Peripheral's Unltd. B.I.T.S. and P.I.T.S. and Southeastern Software's "DATA CAPTURE" with Micromodem and communication card. These packages give ability to upload, transfer and download files from remote computers, and all at 80 columns! • Programma Int. latest assembler LISA V:20 will support full 80 column display • is transparent for use with Basic and Pascal • software on disk for easy modification and adaptation for different applications • completely commented source listing of software and hardware schematics available • PASCAL (optional) • becomes the console when installed in Pascal • Permits 80 column text processing with full upper/lower case while using Pascal's editor • must be plugged into slot 3 when operating with Pascal

Available now at your local computer store. **\$295.00**

Call Computer Stop for Store nearest you

Calif. Residents add 6% Sales Tax

Shipping, Insurance, Handling, extra

*Apple is a Registered TM of Apple Computers, Inc.

Dealer Inquiries Invited.
Contact:

COMPUTER STOP CORP.
2545 West 237th St.
Suite L
Torrance, CA 90505
539-7671

The Computer Stop
16919 Hawthorne Blvd.
Lawndale, CA 90260 ✓ 283
(213) 371-4010

MON. - SAT.
10-6


```

; FOR - compile beginning of FOR loop
; EXIT: TOP - address of middle of conditional jump
;           to be filled in by LOOP
;           TOP-1 - address of FORTEST instruction, the
;                 beginning of the FOR loop
; DESCRIPTION: Compiles FORINIT and FORTEST instructions.
; Follows the FORTEST with a jump-if-not-zero. Leaves the
; address of the FORTEST instruction and the address of
; the second word of the conditional jump instruction
; on the stack to be used by LOOP. Notice that the stack
; is left in the same condition a REPEAT and UNTIL would
; have left it in.

```

```

067F 4702    FOR      DW      TCALL      ;threaded code
0681 C702DB06B3    DW      TPUSH,FORINIT,CMLW      ;compile FORINIT
0687 6404AB0276    DW      CODE,PEEKW,DEC      ;save next address
068D C702E906B3    DW      TPUSH,FORTEST,CMLW      ;compile FORTEST
0693 C7021803B3    DW      TPUSH,IFNZ,CMLW      ;compile conditional jump
0699 6404AB02      DW      CODE,PEEKW      ;save next address
069D 6C03B305      DW      ZERO,CMLW      ;compile a zero temporarily
06A1 5B02          DW      TRET

```

Listing 9. FOR—compile beginning of FOR loop.

```

; FOR LOOP Index Variables
; The following functions implement the words I, J and K wh
; lookup the current value of the index variable for the innermost
; second and outermost FOR LOOPS.

```

```

; I, J, K - FOR LOOP index Variables
; ENTRY: No Values Expected
; EXIT: TOP - value of index variable
; DESCRIPTION: performs a table lookup on the Loop Stack.
; 'I' selects the first element on the stack, 'J' selects
; the third and 'K' selects the fifth. (Every other
; element contains the terminating value of the loop variable.)

```

```

0714 1607      XI      DW      $+2      ;machine code
0716 11FFFF      LXI     D,-1      ;1st element for I
0719 C32907      JMP      XN
071C 1E07      XJ      DW      $+2      ;machine code
071E 11FDFF      LXI     D,-3      ;3rd element for J
0721 C32907      JMP      XN
0724 2607      XK      DW      $+2      ;machine code
0726 11FBFF      LXI     D,-5      ;5th element for K
0729 2A5307      XN      LHLD     LSTACK ;get loop stack pointer
072C 19          DAD      D          ;offset to desired element
072D 56          MOV      D,M        ;DE ← element
072E 2B          DCX      H
072F 5E          MOV      E,M
0730 D5          PUSH     D          ;stack the value
0731 C33702      JMP      NEXT
0732 PMGE

```

Listing 10. FOR LOOP index variables.

Listing 11a. New additions to compiler version.

```

; New Additions to Compiler Version
; IFGT - jump if TOP-1 > TOP
;
; Version 1.5 new function
0333 3503      IFGT     DW      $+2      ;CODE
0335 D1          POP      D          ;DE ← TOP
0336 E1          POP      H          ;HL ← TOP-1
0337 CD4003      CALL     SUB16      ;HL ← TOP-1 - TOP
033A D2F702      JNC      JUMP1      ;jump if TOP is smaller
033D C30D03      JMP      SKIP      ;otherwise don't
; SUB16 - 16 bit subtraction
; ENTRY: HL - subtrahend
; DE - the other one
; EXIT: HL - 16 difference (HL-DE)
; Carry set if HL<DE
; REGISTER USE: A PSW
0340 7D          SUB16    MOV      A,L
0341 93          SUB      E
0342 6F          MOV      L,A
0343 7C          MOV      A,H
0344 9A          SBB      D
0345 67          MOV      H,A
0346 C9          RET

```

```

; CFLAG - local variable for compiler
; DESCRIPTION: set to zero at initiation of compile loop,

```

More

FAST FASTER FASTEST

IT'S YOUR CHOICE

You can sort fast using your present facilities, or you can do it faster with Racetrack's superb facilities, or you can use the fastest: SUPERSNAPP X. The heart of SUPERSNAPP X is a SUPER FAST in-memory sort routine that has been benchmarked against everything on the market and bears them all ... hands down.

SUPERSNAPP X is the most important component of SNAPP X EXTENDED BUILT-IN FUNCTIONS which is a much needed set of additions to the Model II BASIC interpreter that will put time saving power at your fingertips. Let's compare (using random data) SUPERSNAPP X and Racetrack's GSF SORT for speed:

SORT	SUPERSNAPP X	RACETRACK GSF
10,000 Integers	39 seconds	59 seconds
5,000 Singles	22 seconds	34 seconds
2,000 Strings	10 seconds	15 seconds

SUPERSNAPP X is guaranteed to be the FASTEST in memory SORT on the market or your money back. With it you also get these EXTENDED BUILT-IN FUNCTIONS: PEEK PEEKW POKE POKEW XDAT\$ XTIM\$ ETIM\$ FILES AND THE SPECIAL SCMD (SNAPP-COMMAND). PLUS: open "E": Set SCROLL PROTECTION. ERASE all ARRAYS in one command. Specify size and Blink rate of CURSOR. Long ERROR messages. Read from Video. Screen Read. Diskette ID's and more! If you want the FASTEST SORT on the market, you want SUPERSNAPP X. Don't waste time. Call or write today for SUPERSNAPP X. \$100.00

SNAPP INC.
SNAPP INC.
SNAPP INC.
SNAPP INC.
SNAPP INC. ✓ 257

8160 Corporate Park Dr.
Cincinnati, Ohio 45242

Call Toll Free
1-800-543-4628

Ohio residents
call collect (513) 891-4496
All products now available to run with TRSDOS 2.0.

Now available for Model III

COMPUCOVER®



COVER YOUR INVESTMENT

- Cloth Backed Naugahyde Vinyl
- Waterproof & Dustproof
- Longer Life
- Improved Reliability
- Two Decorator Colors—Saddle Tan and Black

APPLE COMPUTERS	
Apple Ensemble - covers entire Apple II with 8" video & two stacked disk	\$19.95
Full Apple II	12.95
Apple II Keyboard	7.95
Apple II Disk (stacked-two disk)	7.95
APPLE III available soon	
TRS-80 MODEL I	
Keyboard	\$ 7.95
Cassette	4.95
Video Display	9.95
Package Offer	18.95
*NOTE: Add \$3.00 for Expansion Interface	
TRS-80 5 1/4" Disk	\$ 4.95
Two Disk Cover (side by side)	7.95
TRS-80 MODEL II	
Entire Unit	\$22.95
Keyboard Only	7.95
Three Disk Unit (5" Drives)	18.95
TRS-80 MODEL III	
TRS-80 COLOR COMPUTER	9.95
Line Printer I	\$16.95
Line Printer II	9.95
Line Printer III	15.95
Line Printer IV	9.95
Line Printer VI	14.95
Daisy Wheel Printer II	18.95
Quick Printer I	9.95
Quick Printer II	9.95
PET COMPUTERS	
Pet 2001	\$12.95
Pet 8032	12.95
Pet 2040 Disk	12.95
Pet 2022 Printer	9.95
Pet 2023 Printer	7.95
ATARI 800	
Atari 800	\$10.95
Atari 810 Disk	9.95
CROMEMCO SYSTEM THREE	
Cromemco System Three	\$19.95
Cromemco 3100 CRT	18.95
Cromemco 3778 Printer	18.95
Cromemco 3703 Printer	18.95
SUPERBRAIN	
Emulator	18.95
Interlude	18.95
Superstar	18.95
HEATH COMPANY	
H-19 H-89 CRT	\$18.95
H-17 Disk	9.95
H-27 Disk	12.95
H-77 Disk	9.95
H-8, H-11 Computers	12.95
H-14 Printer	9.95
H-34 Printer	15.95
H-36 Printer	18.95
DIGITAL ELECTRONICS	
Data System Terminal	\$19.95
Desktop Terminal	18.95
WT/78 Terminal	18.95
VT/78 Terminal	18.95
VT-100 Terminal	18.95
Decprinter I	15.95
Decprinter II	18.95
Decprinter III	18.95
Decprinter IV	15.95
OHIO SCIENTIFIC	
C1P Computer with Keyboard	\$14.95
C4P Computer with Keyboard	14.95
C2D Computer	19.95
C3D Computer	19.95
C2 OEM Computer	19.95
C3 OEM Computer	19.95
C3-S1 Computer (single)	18.95
C3-S1 Computer (stacked)	22.95
WANG COMPUTERS	
Terminal with disk	\$20.95
Terminal without disk	18.95
2221 Printer	19.95
2221-W Printer	22.95
2231 Printer	19.95
2261 Printer	19.95
CPT 8500 Computer	\$22.95
CPT Rotary V Printer	12.95
CPT Rotary V Printer	15.95
CompuColor II Entire Unit	\$16.95
CompuColor II Keyboard	5.95
Vector Graphic MZ Computer	\$14.95
Vector Graphic Mindless Terminal	16.95
North Star Horizon	\$14.95
Hewlett Packard 85 Sorcerer	9.95
Texas Instruments 99/4	9.95
InterColor 3621	18.95
PolyMorphic System 8813 Computer	4.95
PolyMorphic Keyboard	7.95
CRT	
Telesideo TVI 912 or 920	\$14.95
Hazratina (one size fits all)	18.95
Sorac IQ 520	18.95
Adds Terminals 25, 100, 980, etc.	19.95
ADM-3	14.95
Leadex Video 100	9.95
Leadex Video 100-80	12.95
PRINTERS	
NEC Spinner with Keyboard	\$15.95
NEC Spinner without Keyboard	15.95
Dialo with Keyboard	15.95
Dialo without Keyboard	15.95
Xerox with Keyboard	15.95
Xerox without Keyboard	15.95
Qume Sprint III	14.95
Qume Sprint V with Keyboard	15.95
Qume Sprint V without Keyboard	15.95
Teletype 43	12.95
IGS 440 Paper Tiger	12.95
Texas Instruments 800 Series	16.95
Tridicon 100 or 200	9.95
Centronics 101	19.95
700, 701, 702, 703, 704, 753	18.95
Centronics 719	18.95
Centronics F1 730, 737	9.95
Comprint 912	12.95
Aradex DPM200	12.95
Kumec HY Q 1000	12.95
Okidata 22	15.95
Okidata SL125	15.95
Okidata SL250	15.95
DISK DRIVES	
Microplus 1041, 1042, 1043, 1053	\$ 9.95
Vista Double Disk	9.95
Vista 5 1/4" Disk	8.95
Matchless 5 1/4" Disk	8.95
Lobo Double 8" Disk	9.95
Lobo 5 1/4" Disk	8.95
MINI 851 or 852 Disk	4.95
Percom 5 1/4" Disk	4.95
MINI'S and MAXI'S	
IBM 3610 Printer	\$12.95
IBM 3604 Keyboard	9.95
IBM 3610 and 3604 Ensemble	15.95
IBM 5120 Computer	22.95
IBM 5103 Printer	19.95
IBM 3276	22.95
IBM 3276 (crt & keyboard)	22.95
IBM 5251 Keyboard	9.95
DATA GENERAL	
Dasher LP2	\$15.95
Dasher TP1	15.95
Dasher TP2	15.95
Dasher D108	19.95
Dasher D200	19.95
6052 CRT and Keyboard	19.95
Honeywell VIP 7200 (crt&keyboard)	\$22.95

Send check or money order to

Include \$1.50 for postage and handling.
Overseas orders include \$4.00 postage.

DEALER INQUIRES INVITED

COMPUCOVER

P.O. Box 324 (Dept. A)
Mary Esther, FL 32569
Phone (904) 243-5793

✓ 90

Listing 11a continued.

```

; set to -1 by semicolon and error routines to signal the
; end of compilation.

0347 7C03      CFLAG   DW      VARIABLE
0349 0000                      0

034B 6303      CONADD  DW      CONSTANT      ;address of CONSTANT code
034D 6303      DW      CONSTANT
034F 6303      VARADD  DW      CONSTANT      ;address of VARIABLE code
0351 7C03      DW      VARIABLE

; GETWORD - get a word from input
; ENTRY: No Parameters expected
; EXIT: TOP - pointer to a word read from console
; DESCRIPTION: Uses SCAN to retrieve next word on
; line. If there is no next word, reads a line
; from the console and uses SCAN again.

0353 4702      GETWORD DW      TCALL          ;threaded code

0355 E407      GW1     DW      SCAN            ;get next word
0357 18036003  DW      IFNZ,GW2-1          ;if gotten
035B 9904      DW      READLINE           ;else read a line
035D F5025403  DW      JUMP,GW1-1         ;and try again
0361 5B02      GW2     DW      TRET
                                PAGE

```

; Stack Tests

; These auxiliary functions test the stack for conditions
; similar to those tested by the conditional jumps. They leave
; the results of their tests on the stack (True = -1, False = 0)
; for testing by IF or UNTIL. Tests like these replace the conditional
; jumps in the compiler language which has no GOTO statements.
; The functions are written in machine language for efficiency
; since they tend to be executed frequently.

; EQ - test if TOP = TOP-1

; DESCRIPTION: Pops the top two elements of the stack and replaces
; them with a -1 if they were equal or a zero if they were not.

```

06B3 B506      EQX     DW      $+2          ;CODE
06B5 E1        POP     H                    ;get TOP
06B6 D1        POP     D                    ;get TOP-1
06B7 CD4003    CALL    SUB16               ;subtract
06BA 7C        MOV     A,H                 ;test for zero
06BB B5        ORA     L
06BC 210000    LXI     H,0                 ;anticipate false
06BF C2C506    JNZ     EQX1               ;if not equal
06C2 21FFFF    LXI     H,-1              ;else return true
06C5 E5        EQX1    PUSH    H            ;stack the answer
06C6 C33702    JMP     NEXT               ;and continue

```

; EQZ - test if TOP = 0

; DESCRIPTION: Pops the top of the stack and replaces it with
; a -1 if it was zero or a zero if it was not.

```

06C9 CB06      EQZ     DW      $+2          ;CODE
06CB E1        POP     H                    ;get TOP
06CC 7C        MOV     A,H                 ;test for zero
06CD B5        ORA     L
06CE 210000    LXI     H,0                 ;anticipate false
06D1 C2D706    JNZ     EQZ1               ;if not zero
06D4 21FFFF    LXI     H,-1              ;else return true
06D7 E5        EQZ1    PUSH    H            ;stack the answer
06D8 C33702    JMP     NEXT
                                PAGE

```

Listing 11b. Stack tests.

Listing 11c. CMLPW—compile a word of code.

; CMLPW - compile a word of code
; ENTRY: TOP - 16 bit word to be compiled
; EXIT: No Values Returned
; DESCRIPTION: Stores the word in the code section
; of the dictionary. Updates the CODE pointer.
; Yields an error if the dictionary is full.

```

05B3 4702      CMLPW   DW      TCALL          ;threaded code
05B5 6404AB02E5 DW      CODE,PEEKW,DUP,INC,INC ;add two to code
05BF E5026004AB DW      DUP,NAMES,PEEKW ;compare with names
05C5 3303D005   DW      IFGT,CERROR-1 ;if memory full
05C9 6404BD02   DW      CODE,POKEW ;else store new code pointer
05CD BD02       DW      POKEW ;and compile word
05CF 5B02       DW      TRET

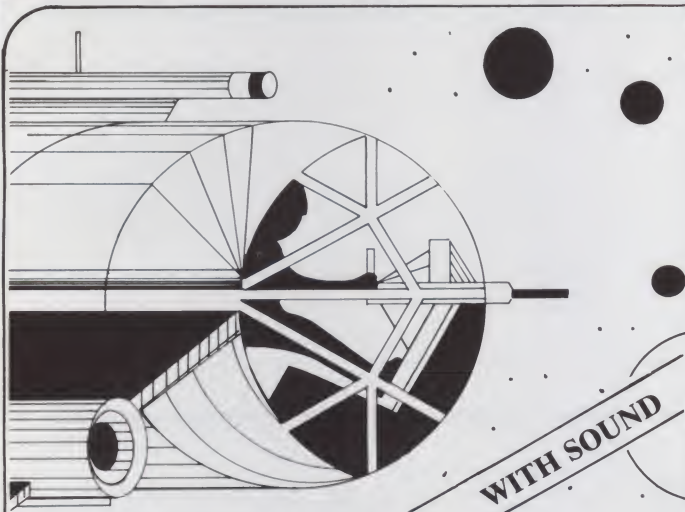
05D1 C702A205   CERROR DW      TPUSH,EEMSG ;print bad new
05D5 EB05       DW      UERROR

```

More

GO BOLDLY...

Where No TRS-80* Program Has Gone Before!



ASTEROID

DATE: 28.02.2047
LOCATION: 270 million miles from Terra
MISSION: Maintaining Terra's Space Lanes

Briefing will follow:

1.1 Your mission is to destroy any asteroids in your sector and to prevent alien spacecraft from infiltrating the Terran Defense Network.

1.2 Your ship is armed with an anti-matter cannon. You can shoot large asteroids, but this turns them into many smaller asteroids, each capable of destroying your ship.

1.3 In addition, alien ships can make in-

stantaneous hyperspace jumps into your area and start firing on your ship.

1.4 You'll need lightning reflexes and nerves of steel to survive Asteroid. We have no use for non-survivors!

Asteroid, a real-time, machine-language game, features variable levels of difficulty, superb high-speed graphics, sound effects and automatic score keeping. (T1) or (T2)

Order No. 0237R

\$14.95 Tape.

Order No. 0247RD

\$19.95 Disk.



COSMIC PATROL

WARNING: PLAYERS OF THIS GAME SHOULD BE PREPARED FOR A STATE OF REALISM HITHERTO UNAVAILABLE ON THE TRS-80

Skilled players soon master many difficult computer games, but COSMIC PATROL is in a world all its own. The challenge intensifies! Supporting graphics and sound (optional) make each encounter an exciting new experience. It all adds up to a Super 3-S package... skill, sight and sound.

Scenario: The Cosmic Patrol program puts you in the command chair of a small interstellar patrol craft. Your mission is to defend Terran space and prey on the Quelon supply ships which carry essential parts and lubricants for that implacably hostile robotic force. The drone freighters

are fairly easy pickings for the accomplished starship pilot, but beware of the I-Fighter escorts. They're armed, fast and piloted by intelligent robots linked to battle computers. They *never* miss.

The Cosmic Patrol program is not just another search and destroy game. With its fast, real-time action, impressive sound option and superb graphics, this machine-language program is the best of its genre.

Don't keep putting quarter after quarter into arcade games or spending big bucks for video game cartridges. Get Cosmic Patrol from Instant Software—and get the best for less! (T1)

Order No. 0223R

\$14.95 Tape.

Order No. 0224RD

\$14.95 Disk.

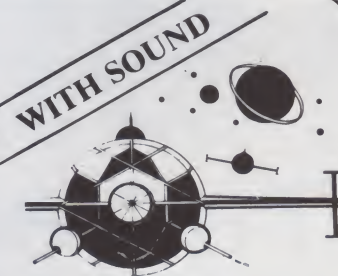
(T1) = TRS-80 Model 1, Level II, 16K RAM.

(T2) = TRS-80 Model 1, Level II 16K, Expansion Interface 16K + 1 disk drive.

BALL TURRET GUNNER

For years the Petro Resource Conglomerate has attacked our photon collection stations and strangled our deep-space trade routes. The PRC Exxonator Class light fighters (code name: Gnat) have been their main weapon. Now you can strike back, by joining the Ball Turret Gunner Service.

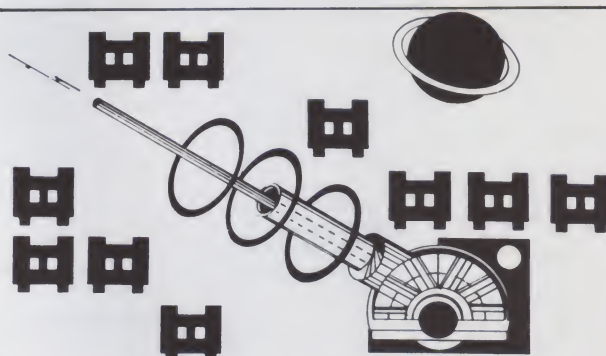
Imagine yourself at the control console of an LW-1417 Stratoblazer (Type B Strategic Laser Weapon). Your Hindsight Director informs you that a Gnat fighter is coming in for an attack. You pivot your gigawatt laser turret until you can see the target on your monitor. The Range Indicator shows him coming in fast. The Targeting Computer studies his course and speed as your finger tenses over the firing key. You know you'll have only a fraction of a second in which to react. The Gnat fighter's evasive maneuvers cause him to dance in your sights. Suddenly,



you see the FIRE Command and you react instinctively. Your laser beam lashes out and reduces the Gnat to an expanding ball of ionized gas. Mission accomplished!

Ball Turret Gunner, with your choice of multiple levels of difficulty, optional sound effects and superb graphics, is more than just a game. It's an adventure. Experience it! (T1)

Order No. 0051R \$9.95.



INVADERS

The INVADERS are coming! Earth's defenses are dead except for your Laser base. Your assignment is to destroy the approaching INVADERS before they destroy Earth. Before Earth's sensors failed, they detected 550 armed invaders in space, speeding toward us in 10 attack formations of 55 in each group. The sensors detected four different types of attack craft: Large, Medium, Small, and a short profile craft which is the most difficult to destroy. If you cannot stop these space attackers they will stop Earth... for good. (T1)

Order No. 0240R \$9.95.

TO ORDER

See Your Local
Instant Software Dealer
or Call Toll-Free
1-800-258-5473

Instant Software™

PETERBOROUGH, N.H. 03458 603-924-7296

✓ 40

✓ Reader Service—see page 178

*A trademark of Tandy Corporation

Microcomputing, March 1981 61

If you're looking for
the best prices
in the U.S.A. on



TRS-80[®] MICROCOMPUTERS

We have consistently offered the TRS-80 line at savings **up to 20%**, which means you can save \$150 to \$1500 by buying directly from Computer Discount of America.

**TRS-80 Model II, 64K System,
with disc drive only \$3385.00**

Other TRS-80 Model II, or Model III computers and systems, Color Computers, and Pocket Computers are in stock at similar savings.

Our savings are as big on expansion interfaces, printers, diskettes — everything for your TRS-80 System.

ATARI[®]
MICROCOMPUTERS



We have the full line of ATARI personal computers and systems, including Models 400 and 800.

The computers, accessories, and hardware are brand new, in factory sealed cartons, and carry a full factory warranty.

Most models are in stock for immediate delivery (usually within 7-10 days), and a price quote is as near as your phone.

So if you're looking for the **best prices in the U.S.A.**, for microcomputers and accessories, call Computer Discount of America, Inc., West Milford, New Jersey 07480. 201-728-8080. **NO TAX ON OUT-OF-STATE SHIPMENTS.**

TOLL FREE 800-526-5313

**Computer
Discount
of America**

Authorized TRS-80 dealer, store B-282.

Listing 11c continued.

```
05D7 5B02          DW      TRET

; ERROR - error during compilation
; ENTRY: TOP      - pointer to error message
; DESCRIPTION: Prints message and aborts compilation

05D9 4702          ERROR   DW      TCALL          ;threaded code
05DB A307          DW      PRINTS          ;print message
05DD 74034703BD    DW      NEGONE,CFLAG,POKEW    ;abort compilation
05E3 7403F504B5    DW      NEGONE,CONBUF,POKEB    ;skip remainder of input 1
05E9 5B02          DW      TRET

; UERROR - 'UNDO' ERROR
; DESCRIPTION: same as ERROR but first 'undoes' the
; partially completed compilation.

05EB 4702          UERROR  DW      TCALL          ;threaded code
;reset NAMES pointer
05ED 6004AB02E5    DW      NAMES,PEEKW,DUP ;current names pointer
05F3 A1027E02      DW      PEEKB,TADD ;plus length of string
05F7 6E02E5026E    DW      INC,DUP,INC,INC ;plus three(save ptr to old CODE)
05FF 6004BD02      DW      NAMES,POKEW ;gives new names pointer
;reset CODE pointer
0603 AB02          DW      PEEKW ;code pointer for aborted entry
0605 6404BD02      DW      CODE,POKEW ;replace current code pointer
0609 D905          DW      ERROR ;normal error
060B 5B02          DW      TRET
PAGE
```

```
; System Variables

; Names - address of interpreter dictionary names

0460 7C03          NAMES   DW      VARIABLE ;threaded code variable
0462 0909          DW      NAMEBEG ;beginning of names

; CODE - address of the dictionary code section

0464 7C03          CODE    DW      VARIABLE
0466 0909          DW      NAMEBEG ;assembles just before names

; CDICT - address of compiler dictionary names

0468 7C03          CDICT   DW      VARIABLE
046A 0C0A          DW      CNAME
PAGE
```

Listing 11d. System variables.

```
; MVBYTES - move a block of bytes forward
; ENTRY: TOP      - byte count
; TOP-1 - target address
; TOP-2 - source address
; EXIT: No Values Returned
; DESCRIPTION: Moves the block of bytes beginnin
; at the source address to the target address.

08F7 F908          MVBYTES DW      $+2 ;CODE subroutine
08F9 C1            POP      B ;BC <- count
08FA D1            POP      D ;DE <- target
08FB E1            POP      H ;HL <- source

08FC 7E            MVB1     MOV      A,M ;get next byte
08FD 12            STAX     D ;store it
08FE 23            INX      H ;bump source pointer
08FF 13            INX      D ;bump target pointer
0900 0B            DCX      B ;decrement count
0901 78            MOV      A,B ;test for zero
0902 B1            ORA      C
0903 C2FC08        JNZ      MVB1
0906 C33702        JMP      NEXT ;exit when finished
PAGE
```

Listing 11e. MVBYTES—move a block of bytes forward.

Listing 11f. The names in the dictionary.

```
; The Names in the dictionary
; Notice that the actual printed names are chosen for typing
; convenience and do not necessarily match the internal names
; which must conform to the assembler's rules. Also, not all
```

More

Listing 11f continued.

```

; functions have been included here.

0909 = NAMEBEG EQU $ ;BEGINNING OF INTERPRETER DICTIONARY
0909 013A DB 1,':' ;note that the compiler is a word in the
090B C303 DW COMPILE ;interpreter's dictionary

090D 012B DB 1, '+' ;arithmetic words
090F 7E02 DW TADD
0911 012D DB 1, '-'
0913 9902 DW TSUB
0915 042F4D4F44 DB 4, '/MOD' ;(not '/'; yields quotient and remainder)
091A BC08 DW DIV
091C 03494E43 DB 3, 'INC'
0920 6E02 DW INC
0922 03444543 DB 3, 'DEC'
0926 7602 DW DEC
0928 054D494E55 DB 5, 'MINUS'
092E 8702 DW MINUS
0930 024551 DB 2, 'EQ' ;stack tests
0933 B306 DW EQX
0935 0345515A DB 3, 'EQZ'
0939 C906 DW EQZ
093B 0149 DB 1, 'I' ;FOR LOOP index values
093D 1407 DW XI
093F 014A DB 1, 'J'
0941 1C07 DW XJ
0943 014B DB 1, 'K'
0945 2407 DW XK
0947 05434C4541 DB 5, 'CLEAR' ;stack manipulating words
094D ED02 DW CLEAR
094F 03504F50 DB 3, 'POP'
0953 D702 DW TPOP
0955 0453574150 DB 4, 'SWAP'
095A DD02 DW SWAP
095C 03445550 DB 3, 'DUP'
0960 E502 DW DUP
0962 0546495253 DB 5, 'FIRST'
0968 C107 DW FIRST
096A 055045454B DB 5, 'PEEKW'
0970 AB02 DW PEEKW
0972 055045454B DB 5, 'PEEKB'
0978 A102 DW PEEKB
097A 05504F4B45 DB 5, 'POKEW'
0980 BD02 DW POKEW
0982 05504F4B45 DB 5, 'POKEB'
0988 B502 DW POKEB

PAGE
098A 0852454144 DB 8, 'READLINE' ;soe input/output words
0993 9904 DW READLINE
0995 045343414E DB 4, 'SCAN'
099A E407 DW SCAN
099C 065052494E DB 6, 'PRINTS'
09A3 A307 DW PRINTS
09A5 06434F4E41 DB 6, 'CONAXB'
09AC 8508 DW CONAXB
09AE 06434F4E42 DB 6, 'CONBXA'
09B5 3108 DW CONBXA
09B7 054D415443 DB 5, 'MATCH' ;miscellaneous
09BD 6C04 DW MATCH
09BF 064C4F4F4B DB 6, 'LOOKUP'
09C6 2E04 DW LOOKUP
09C8 05454E5445 DB 5, 'ENTER' ;enter word in dictionary
09CE 5C05 DW ENTER
09D0 05434D504C DB 5, 'CMLPW' ;compile a word of code
09D6 B305 DW CMLPW
09D8 0445584543 DB 4, 'EXEC'
09DD 1901 DW EXEC
09DF 074D564259 DB 7, 'MVBYTES'
09E7 F708 DW MVBYTES
09E9 0745584543 DB 7, 'EXECUTE'
09F1 9104 DW EXECUTE
09F3 064D454D4F DB 6, 'MEMORY' ;VARIABLE; value=top of memory
09FA 7803 DW MEMORY
09FC 04434F4E53 DB 4, 'CONS' ;CONSTANT; value=address of CONSTANT code
0A01 4B03 DW CONADD
0A03 0556415242 DB 5, 'VARBL' ;CONSTANT; value=address of VARIABLE code
0A09 4F03 DW VARADD
0A0B 00 DB 0 ;END OF INTERPRETER DICTIONARY

;BEGINNING OF COMPILER DICTIONARY

0A0C = CNAME EQU $
0A0C 024946 DB 2, 'IF'
0A0F 0D06 DW IFX
0A11 045448454E DB 4, 'THEN'
0A16 1F06 DW THEN
0A18 04454C5345 DB 4, 'ELSE'
0A1D 2D06 DW ELSEX
0A1F 0652455045 DB 6, 'REPEAT'
0A26 4B06 DW REPEAT
0A28 0554E5449 DB 5, 'UNTIL'
0A2E 5506 DW UNTIL
0A30 044C4F4F50 DB 4, 'LOOP'
0A35 6706 DW LOOP
0A37 03464F52 DB 3, 'FOR'
0A3B 7F06 DW FOR
0A3D 013B DB 1, ';'
0A3F A306 DW SEMI
0A41 00 DB 0 ;END OF COMPILER DICTIONARY

0A41 = NAMEEND EQU $-1
0139 = DICSIZE EQU NAMEEND-NAMEBEG-1 ;dicsize in bytes
0130 = IDICSIZ EQU CNAME-NAMEBEG ;inter dicsize in bytes

```

The Computer Broker

**WE BUY
FOR YOU
AT COST.
YOU PAY
FINDER'S
FEE.**

The Computer Broker is a professional wholesale buying service for computer users.

We act as your purchasing agents for computers, peripherals, supplies and furniture.

You pay the lowest wholesale prices because we negotiate the best deals from suppliers by submitting orders to bid daily and purchasing in large volume.

Buy the products you want at prices only dealers and volume buyers get.

All items are shipped to you directly from the manufacturer or distributor and carry the full manufacturer's warranty.

Below is a small sample of available products:

**Superbrain • NEC
Centronics • C.Itoh
Qume • Hazeltine
Texas Instruments
MPI • NEC Ribbons**

The Computer Broker®
1750 Skippack Pike
Building 904
Blue Bell, Pa. 19422
(215) 272-6655

12" BLACK & WHITE LOW COST VIDEO TERMINAL

Easily interfaced with Radio Shack TRS 80

\$165.00 LIST

Will sell 6 feet coaxial cable \$5.00

Texas residents add 5% sales tax.

Add \$5 for shipping and handling



One year
limited warranty

• Ideal for home, personal and business computer systems; surveillance monitors • 12" diagonal video monitor • Composite video input • Compatible with many computer systems • Solid-state circuitry for a stable & sharp picture • Video bandwidth—12 MHz \pm 3 dB • Input impedance—75 Ohms • Resolution—650 lines Minimum 1IN Central 80% of CRT; 550 Lines Minimum beyond central 80% of CRT ref EIA RS-375 • Dimensions—11.375" high; 16.250" wide; 11.250" deep (exclude video input connector) • Weight—6.5 KG (14.3 lbs) net

Use Master Charge/Visa or send money order.

Micro Products Unlimited

P.O. Box 1525, Arlington, TX 76010

817/461-8043

Dealer inquiries welcome

✓ 335

ENTERTAINING, EXCITING & EDUCATIONAL APPLE II SOFTWARE

MATH CHALLENGER—Teaches and tests the basic arithmetic skills to children of 4-12 years. Has four skill levels using graphics and sounds. 8K RAM \$5.95

SEA BATTLE is played much like the popular game of Battleship. You are pitted against the Apple II in this game of hit and miss. Uses dazzling graphics and exciting sounds. 12K RAM \$12.95

HANGMAN—Outwit the computer by guessing a word which the computer selects from an enormous bank of 1160 words. Three skill levels with words ranging from 3-10 letters in length. Colorful graphics with sounds make HANGMAN fun as well as challenging. 16K RAM \$12.95

MARS LANDER—Maneuver the spacecraft to a successful landing on Mars' surface. Uses HI-RES graphics and exciting sounds for a realistic adventure of the future. 24K RAM A \$12.95

RENUMBER your programs in both Integer and Applesoft BASIC's. Machine language routines. \$9.95

Apple II and Applesoft are trademarks of Apple Computers Inc.

FIREFLYER COMPUTING ✓ 31

2075 N. Stadium Lane Provo, Utah 84601
(801) 375-2377

AIM 65 DEVELOPMENT SYSTEM DSAIM 65



The DSAIM 65 is a really complete low cost development system for the 6500 microprocessor family. This powerful development system provides the user with a display of 80 characters by 25 lines, 32K bytes of RAM memory expandable to 64K, over 280K bytes of mass storage on line expandable to over 1 Megabyte, 6 card slots expansion board, Centronics-type printer interface, a powerful disk operating system, BASIC high level language, debug monitor, editor, assembler, powerful system library programs for handling of files by same generic names or extension(s).

Items also sold separately

Call or write for further details. ✓ 334

APPLIED BUSINESS COMPUTER CO.

707 S. State College, Suite G.

Fullerton, Ca. 92631 Tel. 714-871-1411

SURPLUS ELECTRONICS

ASCII

ASCII



TRS-80* COMPATIBLE,
IBM SELECTRIC®-BASED
I/O TERMINAL with
ASCII conversion installed: **\$645.00**

Many Other Items Available:

Tape Drives; Cable;

Cassette Drives; Wire; Power Supplies (5 volt 35 amp. others); Displays; Cabinets; Transformers; Heat Sinks; Printers; Components.

Send for free catalog.

WORLDWIDE ELECT. INC.

130 Northeastern Blvd.

Nashua, NH 03062 ✓ 122

Phone orders accepted using

VISA or Master Charge

TOLL FREE 603-889-7661 • 1-800-258-1036

TRS-80 is a trademark of the Radio Shack Division of Tandy Corporation.

1981 FAR EAST ELECTRONICS TOUR

The Electronics Tour for Marketing, Purchasing, Engineering, Manufacturing, & Product Development Managers and Executives to Meet with Foreign Distributors, Reps, Suppliers, & Buyers, and to Develop Foreign Business Contacts Through Individual and Group Meetings.

Date: October 7-21, 1981

and

October 8-23, 1981

HIGHLIGHTS

Japan Electronics Show in Osaka
Korea Electronics Show in Seoul

Taiwan Electronics Show in Taipei
Hong Kong Consumer Electronics Show

★ Arrangements for Group and Individual Business Meetings ★ Daily Program for Participants Interested in Importing ★ Daily Program for Participants Interested in Exporting
★ Business Briefings by Local Governments, Chambers of Commerce, and U.S. Embassy Commercial Officers ★ Free Time for Individual Appointments ★ First Class Hotel Accommodations ★ Daily Show Transportation

PRICE

From West Coast **\$2,290**
From East Coast **\$2,855**

Price Includes: airfare, hotels (double occupancy), land transportation, daily American breakfast, dinners, cocktails & city tours in each country... and more!

For more information and brochure, call or write to:

Terry Papesh,
Commerce Tours International ✓ 97
870 Market Street, Suite 742
San Francisco, CA 94102
(415) 433-3072 or 433-3408

Cheap, Dumb Apple

By Bill Hubbard

Have you ever wanted to use your Apple as a dumb terminal? This article describes an inexpensive way to do it.

Normally, you'd need a modem costing about \$200 and an interface board for another \$200. But the Electronic Systems Modem (part 109) costs \$27.50. Two recent *Microcomputing* articles describe how to do it [January 1980, p. 52, and February 1980, p. 168].

Now that the high cost of modems has been circumvented, what about an interface? I used the Apple's game paddle connector. You can drive a printer or Teletype from there.

The simple serial output section in the *Apple Red Book* has details about this. But it doesn't tell you how to come back in. The game paddle connector is a two-way street, so if you had a driver program to read one of the game switches as serial ASCII, you could display it on the screen. See listings.

The only additional hardware you'll need is a 16-pin DIP carrier, a 1/4 A mini-fuse and two 100 ohm resistors. A minor enhancement is a 3k resistor and an LED to give a visual indication of the incoming signal. See Fig. 1.

This version uses TTL signals both from the Apple's AN0 output and into its SW2 input. It uses the Apple's 5-volt power supply. I used a slightly different phone connection. Results have been good. See Fig. 2.

To use it, just enter the program by hand, cassette or disk, and from monitor mode type 300 G. All subsequent keyboard characters will modulate the phone line and be displayed. Incoming characters should show up as plain English on your screen. The cursor and all monitor functions are disabled until you hit the reset key.

The driver program resides at locations 300 through 35C and can easily be keyed in by hand and saved to disk or cassette. It consists of an idle loop to continuously check keyboard and input switch, an input routine and an output routine. Mini-assembly and hex listings are included.

This program works only at 110

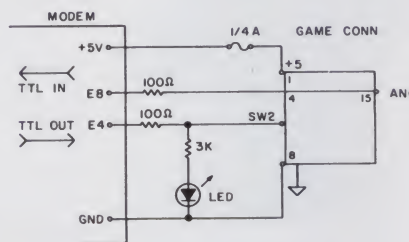


Fig. 1. Connections from inexpensive modem to the Apple game paddle connector allowing it to be used as a timeshare terminal.

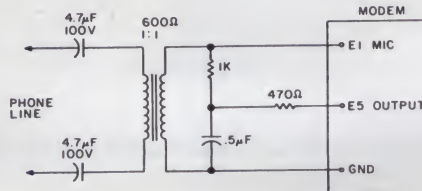


Fig. 2. Simple method of connecting modem directly to phone line.

300	LDA	C000	Keybd
303	BPL	030B	
305	JMP	0339	Output
308	STA	C010	Clear
30B	LDA	C063	Ck Sw
30E	BMI	0300	Loop
310	LDY	#\$08	Bits
312	LDA	#\$25	1/2 bit
314	JSR	FCA8	Wait
317	LDA	C063	Re Ck Sw
31A	BMI	0300	False?
31C	PHA		Save Char
31D	LDA	#\$3B	1 bit
31F	JSR	FCA8	Wait
322	LDA	C063	Ck Sw
325	BPL	032B	Skip
327	SEC		Mark
328	JMP	032C	Skip
32B	CLC		Space
32C	PLA		Pull Char
32D	ROR		Rotate
32E	DEY		Dec Bit
32F	BNE	031C	Done?
331	ORA	#\$80	Hi Bit
333	JSR	FDF0	Display
336	JMP	0300	Loop
339	STA	03FF	Save Char
33C	LDY	#\$0B	11 Bits
33E	CLC		
33F	PHA		Push Char
340	BCS	0347	Skip
342	STA	C058	Space
345	BCC	034A	Skip
347	STA	C059	Mark
34A	LDA	#\$3A	1 bit
34C	JSR	FCA8	Wait
34F	PLA		Pull Char
350	ROR		Rotate
351	DEY		Dec Bit
352	BNE	033F	Done?
354	STA	C010	Clear
357	LDA	03FF	Get Char
35A	JMP	0331	Go Display

Assembly listing of dumb terminal driver.

Correspondence concerning this article should be addressed to Bill Hubbard, 2204 Manlyn Road, Richmond, VA 23229.

FREE
with software purchase—
choice of:
1. One year subscription to **InfoWorld**
2. CP/M Summary (\$4.95 value)

DISCOUNT SOFTWARE

Ad #11

✓ **new items/new prices.**
FANTASTIC PRICE PROTECTION POLICY

We'll match any advertised price on any item that we carry. And if you find a lower price on what you bought within 30 days of buying it, just show us the ad and we'll refund the difference.

It's that simple.

Combine our price protection with the availability of full professional support and our automatic update service and you have the Ultimate Software Plan.

It's a convenient, uncomplicated, logical way to get your software.

CP/M users: specify disk systems and formats. Most formats available.

CP/M*
OSBORNE †
General Ledger# \$ 59/\$20
Acct Rec/Acct Pay# \$ 59/\$20
Payroll w/Cost# \$ 59/\$20
Buy 2 get 1 free \$118/\$57
All 3 & CBASIC-2 \$199/\$71

DIGITAL RESEARCH
CP/M 2.2 Northstar \$149/\$25
✓ CP/M 2.2 Micropolis \$169/\$25
✓ CP/M 2.2 Durango
F-85 \$169/\$25
CP/M 2.2 Cromemco \$189/\$25
CP/M (other versions) Call
PL/I-80 \$459/\$35
Mac \$ 85/\$15
Sid \$ 65/\$15
Z-Sid \$ 95/\$15
Tex \$ 70/\$15
DeSpool \$ 50/\$10

MICROSOFT
Basic-80 \$294/\$30
Basic Compiler \$334/\$30
Fortran-80 \$384/\$30
Cobol-80 \$574/\$30
Macro-80 \$144/\$20
Edit-80 \$ 84/\$20
MuSimp/MuMath \$224/\$25
MuLisp-80 \$174/\$20

MICRO DATA BASE SYSTEMS
HDBS \$250/\$40
✓ MDBS \$795/\$40
Other Call

S.O.F.T.W.A.R.E.
MicroTax* ‡ \$749/\$50
Federal individual \$249/\$25
Federal corporate \$249/\$25
State individual \$249/\$25

TCS†
✓ General Ledger \$ 79/\$25
✓ Acct Receivable \$ 79/\$25
✓ Acct Payable \$ 79/\$25
✓ Payroll \$ 79/\$25
✓ All 4 \$269/\$99

SUPERSOFT
Forth (8080 or Z80) \$129/\$25
Diagnostic I \$ 49/\$20
Other disk software... less 10%

SOFTWARE WORKS
Adapt \$ 69/ na
Ratfor \$ 86/ na

COMPUTER PATHWAYS
Pearl (level 1)# \$ 99/\$25
✓ Pearl (level 2)# \$299/\$40
✓ Pearl (level 3)# \$549/\$65

COMPLETE BUSINESS SYSTEMS‡
✓ Creator \$269/\$25
✓ Reporter \$169/\$20
✓ Both \$399/\$45

MICROPRO
✓ WordStar \$324/\$60
Mail/Merge \$114/\$25

THIS MONTH'S SPECIAL: T.I.M. DBMS JUST \$299.

Terrific for inventory, mailings, financial, you-name-it! Menu-driven, auto-sort, 32000 records per file, any number of files, and dynamic documentation!

✓ WordStar/Mail-Merge \$434/\$85
✓ DataStar \$279/\$60
✓ Word-Master \$119/\$40
✓ SuperSort I \$199/\$40
✓ SuperSort II \$169/\$40
✓ SuperSort III \$119/\$40

PEACHTREE*†‡
General Ledger \$399/\$40
Acct Receivable \$399/\$40
Acct Payable \$399/\$40
Payroll \$399/\$40
Inventory \$399/\$40
Property Mgt \$799/\$40
C.P.A. Client Write-up \$799/\$40
Mailing Address \$349/\$40

STRUCTURED SYSTEMS
GL or AR or AP# \$747/\$25
Payroll# \$747/\$25
Inventory Control# \$447/\$40
Analyst# \$197/\$20
Letterright# \$167/\$20
NAD# \$ 87/\$20
QSORT \$ 87/\$20

GRAHAM-DORIAN†
General Ledger# \$693/\$40
Acct Receivable# \$693/\$40
Acct Payable# \$693/\$40
Job Costing# \$693/\$40
Payroll# \$493/\$40
Inventory# \$493/\$40
Cash Register# \$493/\$40
Apartment Mgt# \$493/\$40

MICRO-AP
Selector III-C2# \$269/\$20
Selector IV# \$469/\$35
✓ S-Basic \$269/\$25

WHITESMITHS
"C" Compiler* \$600/\$30
Pascal (incl "C")* \$750/\$45

EIDOS SYSTEMS
Kiss \$299/\$25
K-Basic \$529/\$50

ORGANIC SOFTWARE
TextWriter III \$111/\$20
DateBook \$269/\$25

SoHo Group
✓ MatchMaker \$ 97/\$20
✓ WorkSheet \$177/\$20

"OTHER GOODIES"
Tiny "C" \$ 89/\$50
✓ Tiny "C" Compiler \$229/\$50
✓ CBASIC-2 \$ 89/\$15
Pascal/Z \$369/\$30

Pascal/UCSD \$299/\$30
Pascal/MT+ \$224/\$30
Pascal/M \$149/\$20
Nevada Cobol \$129/\$25
Raid \$129/\$25
✓ MAGSAM III \$259/\$25
✓ MAGSAM IV \$129/\$10
✓ BSTAM \$129/\$10
FMS-80 \$649/\$45
dBASE II DBMS \$629/\$50
Condor DBMS \$599/\$30
Vulcan DBMS \$469/\$30
T.I.M. DBMS† \$329/\$35
✓ CBS \$369/\$45
Whatsit? \$149/\$25
✓ Ultra-Sort II \$159/\$25
✓ MicroStat \$224/\$15
String/80 \$ 84/\$20
✓ Vedit \$ 99/\$15
Postmaster \$149/\$20
WordSearch \$179/\$25
SpellGuard \$269/\$25
Spell Binder \$349/\$45
✓ VTS-80 \$489/\$65
Magic Wand \$299/\$45
Electric Pencil II \$159/\$25
CPAids... less 12%

APPLE II*
MICROSOFT
Softcard (CP/M) \$292
Cobol \$574

PERSONAL SOFTWARE
Visicalc* \$122
CCA Data Mgr \$ 84
Desktop/Plan \$ 84
✓ Zork \$ 34

PEACHTREE*†‡
General Ledger \$224/\$40
Acct Receivable \$224/\$40
Acct Payable \$224/\$40
Payroll \$224/\$40
Inventory \$224/\$40

MUSE
Super-Text II \$127
Other disk software... less 10%

STC (Software Tech.)
✓ Prof. Time & Billing \$279
Other... less 15%

"OTHER GOODIES"
✓ Data Factory \$129
✓ Whatsit? \$129
✓ Creator \$229
✓ LedgerPlus (GL A/R & A/P) \$549


TRS-80* MODEL II
CP/M 2.2 (P&T) \$159/\$35
Electric Pencil II... less 15%

NORTHSTAR
✓ NorthWord \$299
✓ Mail Manager \$239
✓ Info Manager \$369
✓ General Ledger \$749
✓ Acct Receivable \$449
✓ Acct Payable \$449



300 AD 00 C0 10 06 4C 39 03
308 8D 10 C0 AD 63 C0 30 F0
310 A0 08 A9 25 20 A8 FC AD
318 63 C0 30 E4 48 A9 3B 20
320 A8 FC AD 63 C0 10 04 38
328 4C 2C 03 18 68 6A 88 D0
330 EB 09 80 20 F0 FD 4C 00
338 03 8D FF 03 A0 0B 18 48
340 B0 05 8D 58 C0 90 03 8D
348 59 C0 A9 3A 20 A8 FC 68
350 6A 88 D0 EB 8D 10 C0 AD
358 FF 03 4C 31 03 00 00 00

Hex listing of dumb terminal driver.

baud, only in uppercase ASCII, only in half duplex and only in originate mode. After all, it's only a cheap, dumb Apple. ■

ATARI 800 
16K \$799*
commodore
Pet 16K \$799*
EXIDY Sorcerer
16K \$999*

Call or write for price list with comparable savings on a full line of peripherals and other name brands

 **MicroComputer Warehouse** 
3620 La Habra Way
Sacramento, Ca 95825
(916) 486-3678

• Computers are fully tested and burned in for 48 hours.

♦ Cash price—add 2% for Visa/Mastercharge. Price subject to change without notice.

MICROCOMPUTER CHIPS

4116 CHIPS:

16K—200 NANOSECONDS

GUARANTEED PRIME

IN STOCK FOR
IMMEDIATE DELIVERY

1 SET OF EIGHT . . . \$32.95
10 SETS OF EIGHT . . . \$29.95 EACH

FOR TRS-80, APPLE, MOST OTHER
MICROCOMPUTERS.

call or write immediately
NO C.O.D.s

✓351

GENERAL PERIPHERALS
41 GRASSY PLAINS STREET
BETHEL, CT 06801
(203)743-5583

* — Special Bonus with order † — Requires microsoft BASIC * — Supplied in source code # — Requires CBASIC-2 ‡ — Mfgs Trademark

ORDERS ONLY—CALL TOLL FREE VISA • MASTERCHARGE

1-800-854-2003 ext. 823 • Calif. 1-800-522-1500 ext. 823

Overseas—add \$10 plus additional postage • Add \$2.50 postage and handling per each item • California residents add 6% sales tax • Allow 2 weeks on checks, C.O.D. ok • Prices subject to change without notice All items subject to availability •

THE DISCOUNT SOFTWARE GROUP

1610 Argyle Ave., Bldg. 102 • Los Angeles, CA 90028 • (213) 666-7677

✓250

SUPER BRAIN QD™

Once in a great while someone comes along with a simple improvement for an already great product. Take our SuperBrain, for example. Really a simple concept. A high-powered, low cost micro-computer packaged in an attractive desk top cabinet. So how do you improve on that?

WE DID IT...

It wasn't enough that our SuperBrain had such standard features as twin double density 5¼" drives with over 300,000 bytes of disk storage. A full 32K of dynamic RAM - expandable to 64K in seconds. A CP/M* Disk Operating System which assures compatibility to literally hundreds of application packages presently available. A crisp, 12" non-glare screen with a full 24 line by 80 column display. A full ASCII keyboard with a separate keypad and individual cursor control keys. Twin RS232C serial ports for fast and easy connection to a modem and/or a printer. And, dual Z80 processors which operate at 4 MHz to insure lightning-fast program execution. No, it wasn't enough. So we made it better.

ANNOUNCING SUPERBRAIN QD...

Our new QD model has all of the features of our phenomenally popular SuperBrain with the addition of double-sided disk drives and an extra 32K of dynamic RAM. So, for only a modest increase in price, you can order your next SuperBrain with more than twice the disk and memory storage capability. But, best of all, the new QD model has the same tough, rugged construction and exceptional quality that made our SuperBrain such a success.

HOW DID WE DO IT?

The secret of SuperBrain QD's incredible disk storage lies within our new double-density double-sided disk drives. A total of nearly 720,000 bytes of data are formatted on two specially designed 5¼" drives. And that's more than enough to get you started with most serious small business applications. And SuperBrain QD's standard 64K of dynamic RAM will handle even the most complicated programming tasks.

Of course, if you're into megabytes instead of kilobytes, you may think neither SuperBrain is right for you. Not so! Intertec offers 20-96 megabytes of hard-disk storage which connects in seconds to either the SuperBrain or SuperBrain QD. So, your original investment is always protected. As you grow. No matter how much your needs expand.

BUT IS IT RELIABLE?

Our best salesmen are our present users. Not only have SuperBrain users been impressed with the inherent reliability of the system, they tell us that no other microcomputer system available today offers such a unique modular design concept. Just about the only tool required to easily

maintain the system is a common screwdriver. And Intertec's total commitment to product service and customer support, with service outlets in most major cities, insures your original investment will be a valuable one for many years to come.

THE DECISION IS YOURS.

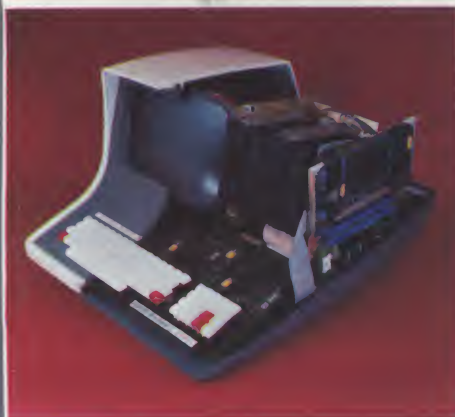
Whether your next SuperBrain is a regular model or our QD version, you will have the satisfaction of knowing you purchased what is becoming one of the world's most popular micro-computer systems. And regardless of which model you choose, you'll probably never outgrow it because you can keep expanding it.

So, call or write us today for more information. Intertec systems are distributed worldwide and may be available in your area now.

**INTERTEC
DATA
SYSTEMS®**

2300 Broad River Rd., Columbia, SC 29210
(803) 798-9100 TWX: 810-666-2115

✓343



ADVENTURES FOR

8K PET®

16K TRS-80®

16K TRS-80® COLOR

ESCAPE FROM MARS—Explore an ancient Martian city while you prepare for your escape.
NUCLEAR SUBMARINE—Fast moving excitement at the bottom of the sea.
PYRAMID—Our most advanced and most challenging adventure. Takes place in our own special ancient pyramid.
VAMPIRE CASTLE—A day in old Drac's castle. But it's getting dark outside.
DEATH SHIP—It's a cruise ship—but it ain't the Love Boat and survival is far from certain.
TREK ADVENTURE—Takes place on a familiar starship. Almost as good as being there.

\$14.95 each

Aardvark Technical Services ✓232

1690 Bolton

Walled Lake, MI 48088

(313) 669-3110 or (313) 624-6316

PET & TRS-80 are trademarks of Commodore and Tandy Corp.

ADD-ON MEMORY? GET THE FACTS!

Japanese 16K RAM chips have a one-to-ten in-service failure ratio to US chips -- from a 1980 Hewlett Packard Study

Do not buy carelessly specified chips or chips of unknown manufacture. We offer 4116-compatible chips from the two top Japanese manufacturers NEC and Fujitsu, for most popular computers and expansion memory boards, including

*APPLE *TRS-80 *NEW PET *HEATH H-89
 *SUPERBRAIN *EXPANDORAM *many others

NEC UPD 416-C 200 NSEC Plastics ..
~~\$44.95/16K~~ SPECIAL \$39.95/16K

FUJITSU 8116E 200 NSEC Ceramics ..
~~\$51.95/16K~~ SPECIAL - \$46.95/16K

*Price at ad copy deadline. We'll beat any legitimate price for comparable chips. Hi-volume users, dealers or clubs ask about further quantity discounts.

Guaranteed good. Send check or money order to

MINIS & MICROS, INC. ✓78

19754 VICTORY BOULEVARD
 WOODLAND HILLS, CA 91367

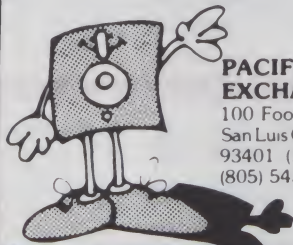
(213) 342-4535

NO Shipping Charge
 CA residents add 6% sales tax



Dysan
 CORPORATION

Solve your disc problems, buy 100% surface tested Dysan diskettes. All orders shipped from stock, within 24 hours. Call toll FREE (800) 235-4137 for prices and information. Visa and MasterCard accepted. All orders sent postage paid.



PACIFIC EXCHANGES

100 Foothill Blvd
 San Luis Obispo, CA
 93401 (In Cal. call
 (805) 543-1037)

✓274

OSI 48 PIN BUSS COMPATIBLE

96 PROTOTYPE BOARD \$33 Holds 96 14 or 16 pin ICs. Also accommodates 18, 24 or 40 pin ICs.
 BP-S80 BACKPLANE \$43 Assembled 8-slot backplane with Molex connectors and resistors.
 IO-CA6 RS-232 SERIAL PORT \$125 Serial I/O port. Dip Switch baud rate selection.
 IO-CA9 CENTRONICS PARALLEL PORT \$175 Parallel printer interface with 10ft flat cable.
 IO-CA6/9 COMBINATION \$215
 IO-1515 MULTI TERMINAL I/O \$310 4 RS 232 I/O Ports. Dip Switch baud rate selection.
 4K Block of 2MHz memory at D000. Ideal for use in multi terminal time shared system.
 CPU-1505 6502 MICROPROCESSOR \$320 6502 CPU board with floppy disk controller, RS 232 serial terminal port & real time clock. Ideal for experimenters or use in OEM time shared systems. Compatible with OSI software.
 MEM-CM9 24K MEMORY \$435 2MHz static low power Dip switch address (8K & 16K blocks) and memory partition selection. 1.6 Amp at +5 V DC.
 MEM-CM9F \$595 As above but adds floppy disk controller and real time clock. 5 or 8in drives. Ideal for OSI C4 or C8 upgrades.
 MEM-KIT 24K \$325 Bare card, 48 2114 300ns low power chips & connectors. You supply 7400 series logic chips.
 MEM-48 48K STATIC 2MHz \$1149 48K ultra low power 2MHz static memory. Designed for use with 6502 CPU. DIP SWITCH memory partition address. Power ONLY 3/4 Amp at +5 V DC.

✓293

D&N MICRO PRODUCTS, INC.

3932 OAKHURST DR. FORT WAYNE, IND. 46815
 (219) 485-6414

TERMS Check or money order. Add \$2 shipping and handling. Indiana residents add 4% sales tax. DEALER INQUIRIES INVITED

grams that are begun by executing a text file are rare in my collection, I did not feel it worth the trouble to add this ability. However, it should be fairly simple to do. The logic in line 100 should be changed to check for a "B" or a "T." Then a new line must be added which goes to either existing line 110 or a new one which EXEC's A\$. Also, line 60 must be modified to prevent the "text" warning from being printed.

Since I wrote Auto-menu, I have used the SCRIN technique in several other programs. There are undoubtedly many applications for this ability to easily access the contents of the display screen. I would enjoy hearing from anyone who uses this method in other situations. ■

— Professional — Real Estate Software

For Apple or TRS-80

Property Management System (32K, 1 Disk Systems)

Features:

- Tenant Information
- Late Rent Reports
- YTD & Monthly Income
- Handies —
 - Partial Payments
 - Returned Checks
 - Advance Payments
 - Prints Receipts
- 5 Digit Expense Accounts
- Building Expense Report
- Vendor Expense Report
- Income Tax Report
- All Reports Can Be Printed
- Complete Documentation
- Easy Data Entry & Edit
- 200 Units per File

Price \$225.00

Real Estate Analysis Modules:

(Cassette or Disk)

- 1) Home Purchase Analysis
- 2) Tax Deferred Exchange
- 3) Construction Cost/Profit
- 4) Income Property Cashflow
- 5) APR Loan Analysis
- 6) Property Sales Analysis
- 7) Loan Amortization

\$35 Per Module

At Computer Stores Everywhere
 Or Order COD Direct
 (Cal Residents Add 6% Sales Tax)
 (213) 372-9418

Real Estate Software
Real Estate Company

Dept. K 1116-G Eighth St. Manhattan Beach, CA 90266

'68' MICRO JOURNAL™

6800-6809-68000

★ The only ALL 68XX Computer Magazine.

Foreign Orders—Add:

Air Mail \$30.00 /Year Surface \$12.00 /Year

1-Year **\$18.50** 2 Years **\$32.50**

3 Years **\$48.50**

OK, PLEASE ENTER MY SUBSCRIPTION

Bill my: M/C ☐ — VISA ☐

Card # _____

Expiration Date _____

For ☐ 1-Yr. ☐ 2 Yrs. ☐ 3 Yrs.

Enclosed: \$ _____

Name _____

Street _____

City _____

State _____

Zip _____

'68' MICRO JOURNAL™

3018 Hamill Road

HIXSON, TN 37343 ✓132

USR-330D Modem

Auto-Dial/Auto Answer \$399

Connect your TRS-80, Apple, or any other computer to the phone lines.

- 0-300 Baud-Bell 103/113 compatible
- Serial-RS232
- Half/Full Duplex
- 1 year warranty

FCC Certified

Direct connection to

phone lines via RJ11C

standard extension

phone jack

USR-330A Modem

\$339

Same as 330D

but Manual-Originator/Auto-Answer.

Radio Shack Model II Users —

We have software to connect you directly

to the phone lines.



U.S. ROBOTICS INC.

203 N. WABASH

SUITE 1718

CHICAGO, ILL. 60601

(312) 346-5650 ✓263

QUALITY SOFTWARE NEED NOT BE EXPENSIVE

Now, for one low price you can acquire two indispensable CP/M software tools for your computer:

(1) CTEXT A complete text formatter written in powerful BDS C. Included are commands for justification, paragraphification, pagination, sectioning, underlining, indexing, automatic generation of a table of contents and much, much, more.

(2) CPMCAT Finally you can organize all of those diskettes which are lying around! This is a comprehensive master catalog system which supports volume names and labels. It is easy to use and has flexible output capabilities. Written in Microsoft Fortran and assembly language. **ONLY \$40.00 for BOTH**

The source code, which is highly structured and completely commented is available for an additional \$40. We support Heath format 5-1/4" diskettes running CP/M*V1.43. Support for 8" drives and CP/M 2.2 will be available in March 1980. Free documentation will be sent upon request. Please send check or money order to:

CHERRY ENGINEERING

P.O. Box 216 Laurel, Md. 20810

301-596-4236 ✓26

(Maryland Residents add 5% Sales Tax)

CP/M is a registered trademark of Digital Research

If you can type, you can handle your accounting, word processing and much more on ISC's Small Business Computer!

The Intecolor® 8963 is just one of a complete line of ISC desktop computers designed for businessmen who don't know how — or don't have time — to write programs. It's CP/M® compatible, so you can choose from hundreds of CP/M business programs — programs that have been proven in hundreds of actual applications.

Programs like General Ledger, Accounts Receivable and Payable, Payroll, Mailing List and Inventory Control are now available *in color*. You'll comprehend data faster, thanks to the proven readability of ISC's eight-color display.

To compose letters and other documents quickly and easily, you'll want ISC's unique *color-coded* Word Processing program. With an optional printer, you can print out as many mistake-free originals as you want!

The Intecolor 8963 gives you all the benefits of color graphics computing at a price that's competitive with black-and-white. It's complete with 19" color graphics display, typewriter-like keyboard, dual disk drive for data storage — even a color version of Microsoft® Business BASIC for those of you who *do* want to program.

Don't let your business get behind the times. Call your ISC sales representative or visit your nearest Factory Authorized ISC dealer and get a "hands on" demonstration *today*.
Color Communicates BetterSM



* U.S. domestic price. Unretouched photo of screen. CP/M is a registered trademark of Digital Research Corp.

OEM Quantity Discounts are available to Qualified Dealers and Volume Users of 25 Systems (or greater) per year. Call your nearest ISC Representative listed below.

ISC SALES REPRESENTATIVES: AL: 205-883-8660. AZ: 602-994-5400. AR: (OK) USDATA Assoc. 918-252-9646. CA: Alhambra 213-281-2280. Goleta 805-964-8751. Irvine 714-557-4460. Los Angeles 213-476-1241. Los Altos 415-948-4563. San Diego 714-292-8525. CO: 303-355-2363. CT: 203-624-7800. DE: (PA) 215-542-9876. DC: (VA) 703-569-1502. FL: Ft. Lauderdale 305-776-4800. Melbourne 305-723-0766. Orlando 305-425-5505. Tallahassee 904-878-6642. GA: Atlanta 404-455-1035. HI: 808-524-8633. ID: (UT) 801-292-8145. IL: (No.) 312-564-5440. (So. MO) 816-765-3337. IN: (IL) 312-564-5440. IA: (Scott County Only) 312-564-5440. (MO) 816-765-3337. KS: (MO) 816-765-3337. KY: 606-273-3771. LA: 504-626-9701. ME: (MA) 617-729-5770. MD: (VA) 703-569-1502. MA: 617-729-5770. MI: Brighton 313-227-7067. Grand Rapids 616-363-9839. MN: 612-645-5816. MS: (AL) 205-883-8660. MO: 816-765-3337. MT: (CO) 303-355-2363. NB: (MO) 816-765-3337. NH: (MA) 617-729-5770. NJ: (No.) 201-224-6911. (So.) 215-542-9876. NV: (AZ) 602-994-5400. NM: 505-292-1212. NY: Metro LI (N.J.) 201-224-6911. N. Syracuse 315-699-2651. Fairport 716-223-4490. Utica 315-732-1801. NC: 919-683-1580. ND: (MN) 612-645-5816. OH: Cleveland 216-398-9200. Dayton 513-435-7684. OK: USDATA Assoc. 918-252-9646. OR: 503-644-5900. PA: (E) 215-542-9876. (W) 412-922-5110. RI: (MA) 617-729-5770. SC: 803-798-8070. SD: (MN) 612-645-5816. TN: 615-482-5761. TX: Austin 512-454-3579. Dallas 214-661-9633. El Paso Area (Las Cruces, NM) 505-524-9693. Houston Only 713-681-0200. UT: 801-292-8145. VT: (MA) 617-729-5770. VA: 703-569-1502. WA: 206-455-9180. WV: (PA) 412-922-5110. WI: (IL) 312-564-5440. WY: (CO) 303-355-2363.

EUROPEAN EXPORT SALES: EUROPE: (MA) 617-661-9424. BELGIUM: Noron S.A. Brussels 02-24236-04. DENMARK: 02-913255. FRANCE: Ruei Malmaison 749-4765. Paris 33-1-306-4606. GREECE: Athens 642-1368. ITALY: Milano 02600733. THE NETHERLANDS: Poeldijk 01749-47640. Amsterdam 020-360904. SPAIN: Mecorsa, Barcelona. TELEX 813-53908. SWEDEN: Teleinstruments AB, Vallingby, 08-380-370. SWITZERLAND: Mutschellen 057-546-55. UNITED KINGDOM: Bournemouth 0201671181. ICELAND: Benco. Ltd., Reykjavik. 091-21945. WEST GERMANY: Koblenz 01149-310256. AUSTRALIA & NEW ZEALAND: Auckland 876-570. Canberra 58-1811. Chermerside 59-6436. Christchurch 796-210. Melbourne 03-543-2077. Sydney 02-808-1444. Wairuomata 644-585.

CANADA: Dorval 514-636-9774. Ottawa 613-224-1391. Toronto 416-787-1208. Vancouver 604-684-8625. **CENTRAL AND SOUTH AMERICA & CARIBBEAN:** (GA) 404-394-9603. **MEXICO:** Monterrey 564-876. **FAR EAST:** (CA) 213-382-1107. **HONG KONG:** Compex, Hong Kong. 03-463-9921. **JAPAN:** (Tokyo) 03-463-9921. **TAIWAN:** (Taipei) 02-7022156. **MIDDLE EAST:** (GA) 404-581-0243. **EGYPT:** 809933. **KUWAIT:** Kuwait 438-180 1,2. **LEBANON:** Beirut 221731 260110. **SAUDI ARABIA:** Jeddah 27790. Riyadh 25083-39732.

For sales and service in other countries contact ISC headquarters in Norcross, GA, U.S.A.



Intelligent Systems Corp.®

✓ 76

Intecolor Drive □ 225 Technology Park/Atlanta □ Norcross, GA 30092 □ Telephone 404/449-5961 □ TWX 810-766-1581

Meet the Electric Crayon

By Michael B. Roberts

Looking for low-cost color graphics for your computer? The Electric Crayon by Percom could be just what you need.

This versatile unit offers ten software-selectable display modes ranging from an alphanumerics mode, which displays 16 lines of 32 characters via a built-in character generator, to a full graphics mode, which displays 192 rows of 256 points. Up to eight colors can be used, depending on the mode selected.

An on-board 6802 microprocessor executes a graphics control program

contained in read-only memory, accepting commands from a keyboard or computer connected to one of the two dual I/O ports. Commands can be input to erase the screen, set display mode and color, plot points, draw horizontal and vertical lines and load machine-language programs or data into the Electric Crayon's memory.

Description

The Electric Crayon is housed in an attractive metal enclosure measuring 9 x 12 x 2.5 inches (23 x 30.5 x 6.4 cm).

The circuitry is contained on a single printed circuit board mounted to the bottom of the cabinet. Two card-edge connectors for the I/O ports extend through slots in the rear of the cabinet. The rear panel also contains the power switch, fuse holder, power cord and an F61 coaxial connector for the video output.

The heart of the unit is the Motorola MC6847 video display generator (VDG) and its friend, the MC1372 chroma and video modulator. The MC6847 reads picture information from the Crayon's on-board random access display memory and translates it into a video signal which is sent to the MC1372. Eight control inputs to the VDG provide mode and color selection under software control for the picture elements in the display. The MC6847 includes an internal character generator that can display 64 ASCII uppercase letters, numerals and symbols in two colors and inverse video (black characters on a colored background).

The MC1372 converts the display information from the VDG into a composite video signal, which is then fed to a monitor. As supplied, the video output from the Electric Crayon will drive a video input on a monitor or modified TV receiver. Instructions are furnished for easily converting the output to a modulated video carrier on UHF channels 33-40. A

Michael B. Roberts, 681 Overland Ave., Cincinnati, OH 45226.



The Electric Crayon exposed.

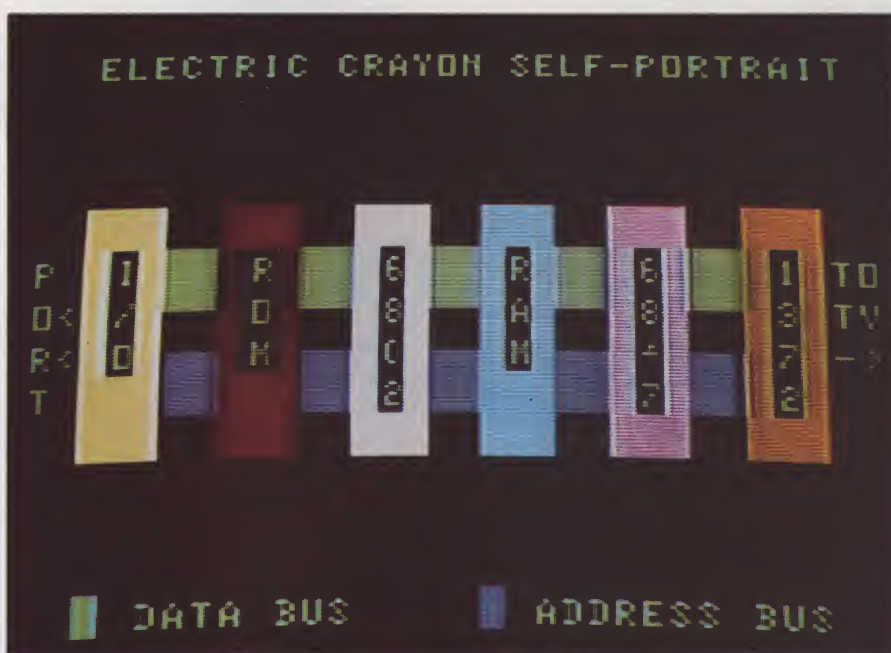
3.579545 MHz crystal controls an internal clock; an output on the MC1372 supplies a clock signal to the VDG and the rest of the circuit.

The brain behind the whole operation is the 6802 microprocessor chip, which is basically an enhanced 6800. In addition to the features of the 6800, the 6802 includes a built-in 128-byte random access memory, which is used as a scratchpad memory by the Electric Crayon's software. The 6802 is kept busy executing the graphics software, placing picture information in the display memory, feeding control signals to the VDG and directing traffic on the address and data buses.

Memory in the Electric Crayon consists of 1024 bytes of display random access memory (RAM) and 1K of read-only memory (ROM) containing the operating system (dubbed EGOS by Percom), with sockets for adding an additional 5K of display memory, 1K of ROM and 1K of program RAM. All RAM chips are 2114s; two of these are required for each 1K of memory. The 1K of display memory furnished will support the alphanumeric display mode and graphics modes of up to 128×64 picture elements. More memory may be added to support the denser graphics modes (refer to the section on display modes for a discussion of memory requirements).

The graphics software that controls the unit is contained in one 2708 erasable read-only memory (EROM) with a capacity of 1K, and a socket is present for a second 2708 to expand the software. Sockets are also provided for two more 2114 RAM chips, which can be used to contain programs loaded in by the user. These are not, however, at all essential for normal operation.

The display memory is loaded by the 6802 in response to commands entered via the input device. This memory stores control information for each picture element of the display, with each location in memory corresponding to a location on the screen. Depending on the mode selected, each picture element displayed requires from one to eight bits of memory. The VDG scans the display memory and produces a video signal based on its contents. Properly coded display data can also be loaded directly into the display memory from the input device, using the LD* (Load) command of the operating system.



Electric Crayon self-portrait.

Input to the Electric Crayon is through a 6820 peripheral interface adapter (PIA) containing dual I/O ports. One of these ports is monitored by the control program, EGOS, for input commands coming from an attached keyboard or computer. The other half of the 6820 can be hooked up by installing jumpers from points on the printed circuit board to the desired contacts on the rear panel connector. Also, a second 6820 can be plugged in, providing two more ports via a separate connector. However, you must load in your own program to access any port other than the normal input port.

Power is furnished by a regulated supply with dc outputs of 12 V, -5 V and +5 V. A small step-down transformer mounted to the bottom of the cabinet provides isolation from the ac power line.

Display Modes

The Electric Crayon has ten display modes providing alphanumerics, semigraphics and graphics in up to eight colors (green, yellow, blue, red, buff, cyan, magenta and orange) plus black.

Mode 0—alphanumerics/semigraphics. This mode is divided into two subsets, which can appear on the screen simultaneously. The first, alphanumerics, will display any of 64 uppercase letters, numbers and various symbols, punctuation marks and math operators in an 8×12 dot pat-

tern. Colors can be green or orange on a black background, or black on a green or orange background.

The second subset, semigraphics, is a bit more complicated. Each semigraphics display element consists of a rectangular block, with 32 blocks fitting horizontally across the screen and 16 vertically; this gives a total of 512 blocks per screen. In mode 0, each of these blocks is divided into four segments, as shown in Fig. 1a. Within each block, these segments can either be illuminated or extinguished, giving 16 possible patterns in any one of the eight colors (segment selection is described under the commands section of this article). These blocks with appropriate patterns illuminated can be combined to make low-resolution pictures, block letters and so on.

Incidentally, graph paper is helpful in constructing a picture with semigraphics blocks, and screen layout pads for the denser graphics modes are available from Percom.

Mode 1—semigraphics. This mode is similar to the four-segment semigraphics of mode 0, except that each

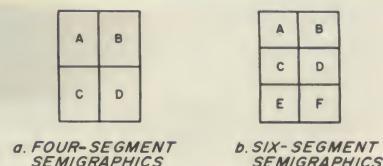
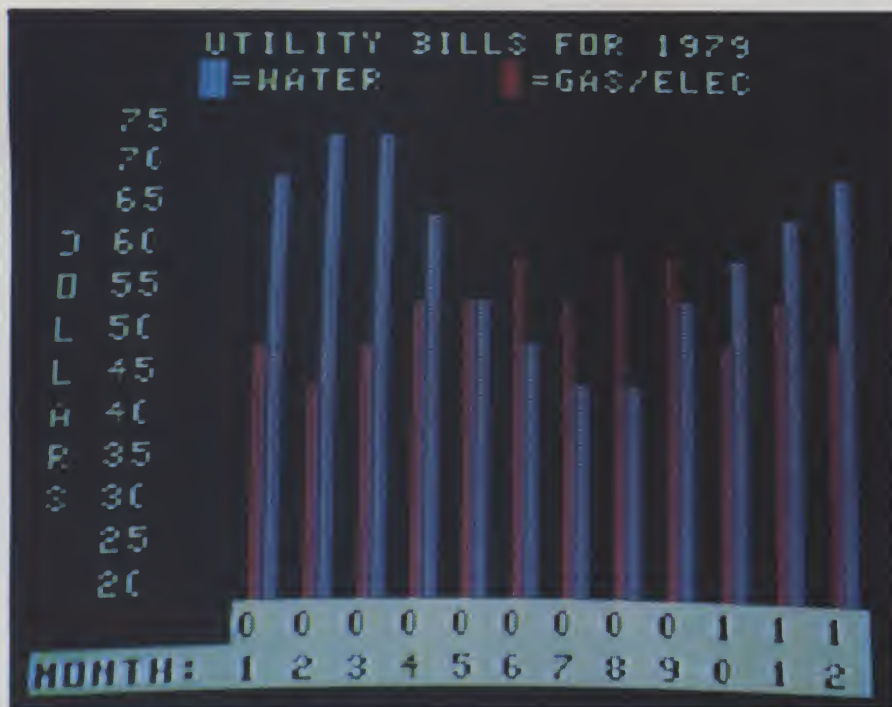


Fig. 1. Semigraphics.



A bar chart in mode 0 semigraphics.

display block is divided into six segments instead of four (see Fig. 1b). Again, there are 32 blocks across the screen and 16 down. The colors can be green, yellow, blue and red on a black background, or, alternately, buff, cyan, magenta and orange on a black background when the Invert command is in effect (refer to the section on commands for details on color selection and inversion procedures).

Mode 2—64×64 graphics. Modes 2 through 9 are full graphics modes, wherein each display element is either on or off, and not subdivided as in the semigraphics modes. Mode 2 provides 64 elements across the screen and 64 down, with each element consisting of four dots horizontally and three screen lines vertically. Colors available in this mode are green, yellow, blue and red on a green background, or buff, cyan, magenta and orange on a buff background in inverse colors. Note that elements displayed in the same color as the background will not be visible, but can be used to erase previously displayed elements of another color to provide animation effects.

Mode 3—128×64 graphics. This mode provides 128 elements across the screen and 64 down. Colors are black and green on a black background surrounded by a green border, or black and buff on black with a buff border. The border is not visible in modes 0 through 2 since it is the

same color as the background.

Note that modes 0 through 3 can be implemented using the 1K of display memory provided with the Electric Crayon. Modes 4 through 9 require additional memory as indicated.

Mode 4—128×64 graphics. This display mode has the same resolution as mode 3, but two pairs of four colors are available as in mode 2. You need 2K of display RAM.

Mode 5—128×96 graphics. With this mode, display resolution improves in the vertical direction; colors are identical to mode 3. Again, 2K of RAM is required.

Mode 6—128×96 graphics. Same resolution as mode 5, but with four colors available as in mode 2. This mode requires 3K of display RAM.

Mode 7—128×192 graphics. Better resolution with the same color choices as mode 3. It requires 3K of display memory.

Mode 8—128×192 graphics. This mode provides the same resolution as mode 7, but with the four colors of mode 2. This mode requires 6K of memory.

0—Green	4—Buff
1—Yellow	5—Cyan
2—Blue	6—Magenta
3—Red	7—Orange

Table 1. Color values for the C command.

Mode 9—256×192 graphics. This is the highest resolution mode, with 256 elements across the screen and 192 down. Each element is one dot wide and one scan line high; colors are the same as in mode 3. It also requires 6K of RAM.

The Electric Crayon Graphics Operation System (EGOS)

EGOS is the Electric Crayon's graphics control program, located in the on-board read-only memory. It accepts and processes commands entered via the main input port; these commands consist of ASCII letters and numbers and may be entered directly from a keyboard attached to the port. A more satisfactory approach is to connect the input port to a parallel output port on your computer and send commands to EGOS using PRINT statements in a BASIC-language program. Some hints on doing this will be offered later. Meanwhile, each command will be explained separately.

ERS—Erase command. As the name implies, this command erases the screen of whatever is displayed, leaving only the background color and border, if it is visible.

M—Mode command. This command selects one of the ten display modes and is normally the first command issued when generating a display. The format is Mx, where x is a number 0–9 corresponding to the desired mode. The Mode command should be followed by ERS to clear the screen; reversing this order could leave garbage on the screen. Also, the M command must be followed by another character, such as a space or carriage return, before it takes effect.

C—Color command. The C command selects the colors to be used when generating a display; the resultant colors depend on the mode selected. The format is Cx, where x is a number from 0 to 7 denoting the desired color (see the color values in Table 1).

For mode 0, the color assignments are exactly as shown in the table. For example, entering C2 will produce blue, and C7 orange; in other words, all eight colors are available. If you select a four-color mode (such as mode 1), the only valid color commands are C0, C1, C2 and C3. If the display is in noninverted mode (see the I command), the colors in the left-hand column of Table 1 will be selected with the above commands (i.e., C0 = green, C2 = blue, etc.); if the

6502	7.45	10/6.95	50/6.55	100/6.15
6502A	8.40	10/7.95	50/7.35	100/6.90
6520 PIA	5.15	10/4.90	50/4.45	100/4.15
6522 VIA	6.45	10/6.10	50/5.75	100/5.45
6532	7.90	10/7.40	50/7.00	100/6.60
2114-L450	3.45	20/3.35	100/3.25	
2114-L200	4.15	20/3.95	100/3.75	
2716 EPROM (5 volt)	10.45	5/9.90	10/9.50	
TMS 2532 EPROM			29.00	
4116-200 ns RAM (NEC)			8 for 35.00	
S-100 Wire Wrap			5" - 2.65	

DISKS

(write for quantity prices)

SCOTCH (3M) 5"	10/2.85	50/2.75	100/2.65
SCOTCH (3M) 8"	10/2.95	50/2.85	100/2.75
Maxell 5" Double Dens.	10/4.25	50/4.10	100/3.95
Maxell 8" Double Dens.	10/4.65	50/4.50	100/4.35
Verbatim 5"	10/2.45	50/2.40	100/2.35
(add .75 for 5" Verbatim plastic storage box)			
Verbatim 8" Dbl. Dens.	10/3.35	50/3.25	100/3.15
BASF 5" soft	10/2.60	20/2.50	100/2.40
BASF 8" soft	10/2.40	20/2.35	100/2.30
Diskette Storage Pages			10 for 3.95
Disk Library Cases	8" - 2.85	5" - 2.15	

COMMODORE PET-CBM

Write or call for quotes

NEW 8016/32 80 column screen

NEW 8050 950K Dual Drive

EDUCATIONAL DISCOUNTS AVAILABLE



ATARI 800 \$777

**All Atari Modules
20% OFF**

SPECIAL-purchase ATARI 800, receive extra 8K memory FREE.

EDUCATIONAL PLAN - buy 2 ATARI Computers, receive 1 ATARI FREE!

WRITE FOR CATALOG

Add \$1.25 per prepaid order for US shipping (UPS)

A B Computers

✓ 121

115 E. Stump Road
Montgomeryville, PA 18936
(215) 699-5826



**DISK DRIVE WOES?
PRINTER INTERACTION?
MEMORY LOSS?
ERRATIC OPERATION?**

Don't Blame The Software!

Power Line Spikes, Surges & Hash could be the culprit!
Floppies, printers, memory & processor often interact! Our unique ISOLATORS eliminate equipment interaction AND curb damaging Power Line Spikes, Surges and Hash.

- ISOLATOR (ISO-1) 3 filter isolated 3-prong sockets; Integral Surge/Spike Suppression; 1875 W Maximum load, 1 KW load any socket \$62.95
- ISOLATOR (ISO-2) 2 filter isolated 3-prong socket banks; (6 sockets total); Integral Spike/Surge Suppression; 1875 W Max load, 1 KW either bank \$62.95
- SUPER ISOLATOR (ISO-3), similar to ISO-1 except double filtering & Suppression \$94.95
- ISOLATOR (ISO-4), similar to ISO-1 except unit has 6 individually filtered sockets \$106.95
- ISOLATOR (ISO-5), similar to ISO-2 except unit has 3 socket banks, 9 sockets total \$87.95
- CIRCUIT BREAKER, any model (add-CB) Add \$ 8.00
- CKT BRKR/SWITCH/PILOT (CBS) Add \$16.00

Master-Charge, Visa, American Express
Order Toll Free 1-800-225-4876
(except AK, HI, MA, PR & Canada)

ESP Electronic Specialists, Inc.

171 South Main Street, Natick, Mass. 01760
Technical & Non-800: 1-617-655-1532

✓ 93

**A P Products
15% OFF**



A P HOBBY-BLOX 15% OFF

All books 15% off

STAR RS232 M0dem	\$135
KIM-1	159
SYM-1	209
KTM 2/80	349
Leedex Monitor	129
DIGIPILOT Plotter	1145
Centronics 737	790
C-10 Cassettes	10/5.65

ZENITH DATA SYSTEMS

Zenith Z19	735
Zenith Z89 - 48K	2150
fullFORTH + for PET	65
PASCAL for PET	\$75
PET Disk Assembler	65
EPSON MX80 Print	545
Itoh STARWRITER	1500
Apple (B&H) - 16K	935

Traditional

NEW

Wire-Wrapping

JUST WRAP

Wire-Wrapping

**WHY CUT?
WHY STRIP?
WHY NOT ...**

**JUST
WRAP™**

WIRE
WRAPPING
TOOL

- AWG 30 Wire
- .025" Square Posts
- Daisy Chain or Point To Point
- No Stripping or Slitting Required
- JUST WRAP™
- Built In Cut Off
- Easy Loading of Wire
- Available Wire Colors:
- Blue, White, Red & Yellow

PATENTED U.S.A.

FOREIGN PATENTS PENDING

JUST WRAP TOOL WITH ONE 50 FT. ROLL OF WIRE		
COLOR	PART NO.	U.S. LIST PRICE
BLUE	JW 1 B	\$14.95
WHITE	JW 1 W	14.95
YELLOW	JW 1 Y	14.95
RED	JW 1 R	14.95
REPLACEMENT ROLL OF WIRE 50 FT.		
BLUE	R JW B	\$ 2.98
WHITE	R JW W	2.98
YELLOW	R JW Y	2.98
RED	R JW R	2.98
JUST WRAP-UNWRAPPING TOOL		
	JUW 1	\$ 3.49

*Minimum billings \$25.00, add shipping charge
\$2.00/New York State residents add applicable tax



**OK Machine & Tool
Corporation**

3455 Conner St., Bronx, N.Y. 10475 U.S.A.
Tel. (212) 994-6600 Telex 125091

✓ 21


```

REM          THIS PROGRAM WILL DISPLAY ALL POSSIBLE PATTERNS FOR
REM          MODE 1 SEMIGRAPHS, IN FOUR DIFFERENT COLORS.
REM
REM          LPRINT "M1 ERS"          REM SET MODE & CLEAR SCREEN
Y=0          REM INITIAL Y AXIS VALUE
FOR C=0 TO 3 REM LOOP THRU COLOR VALUES
X=0          REM INITIAL X AXIS VALUE
LPRINT "C",C REM SET COLOR
FOR P=0 TO 63 REM LOOP THRU PATTERN VALUES
LPRINT "P",P REM SET PATTERN VALUE
LPRINT "S ",X," ",Y REM PLOT THE POINT
X=X+1        REM INCREMENT X AXIS VALUE
IF X=32 THEN Y=Y+2 REM IF END OF LINE, GO DOWN
IF X=32 THEN X=0 REM 2 LINES & RESET X AXIS
NEXT P       REM GET NEXT PATTERN VALUE
NEXT C       REM END OF PATTERNS, DO NEXT COLOR
END

```

Listing 1. A BASIC program to display all patterns for mode 1 semigraphics.

display is inverted, the colors from the right-hand column will be active (C0=buff, C1=cyan, etc.).

Similarly, in modes having only two colors, the only valid color commands are C0 and C1, with C0 producing black (the same as the background) and C1 producing either green or buff for noninverted or inverted displays, respectively. The C command should be issued after the display mode is selected, and will stay in effect until another C command is issued.

Colors can be changed for each element in the display while in the four- or eight-color modes, but all elements in the two-color modes must be the same color. In other words, the entire display must be green on black or buff on black, not a combination of the two. I found the section on color selection in the Electric Crayon manual rather confusing, so I hope this discussion has clarified the subject.

I—Invert command. The I command will change the displayed colors to their complementary colors as explained under the C command; it has no effect in mode 0, which can display all eight colors simultaneously, except to change the color of characters produced with the A or R commands from green to orange. In other modes, this command will invert all colors on the screen, which is to say you cannot use one set of colors on part of the screen and their complements on another. However, interesting blinking effects can be obtained by creating a display and then issuing periodic I commands to reverse the colors.

P—Pattern command. This command operates only in the two semigraphics modes and determines which segments of each display block

are illuminated. The command is entered as Pn, where n is the code for the particular pattern desired. There are 16 possible combinations for mode 0, with four segments per display block, and 64 for mode 1, with six segments. Space does not permit describing every possible combination, but in both modes 0 and 1, P0 means that all segments will be extinguished, and P15 and P63 mean that all are illuminated for the two modes, respectively.

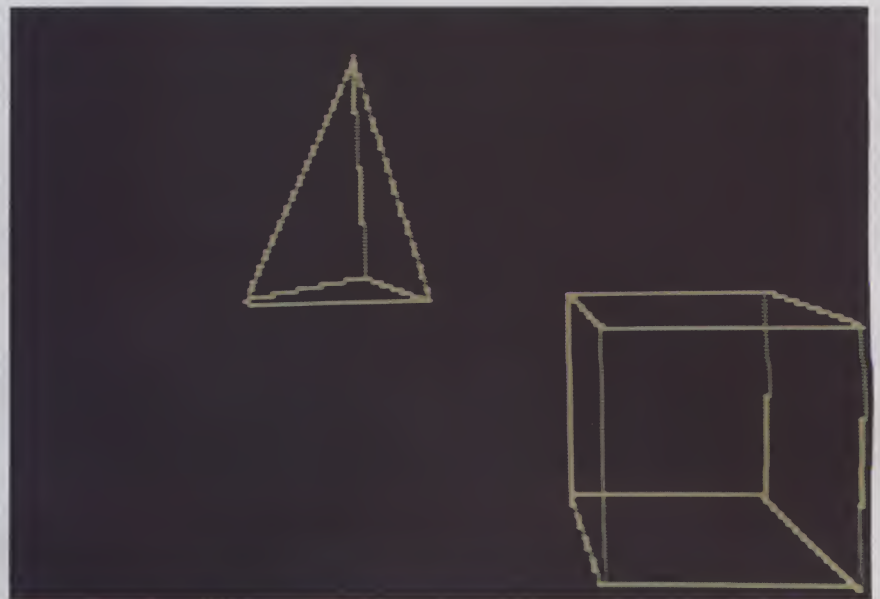
The easiest way to discover the effects of various values for Pn is to write a simple BASIC program to increment through all possible values and output appropriate commands to the Electric Crayon that will display the results. Listing 1 shows such a program.

A—Alpha command. The Alpha

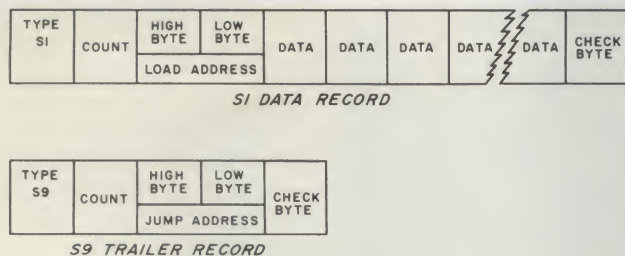
command displays strings of characters in designated locations on the display screen. This command is valid only for mode 0 and can be used in combination with mode 0 semigraphics. The format is A x y aaa..., where x and y are the desired horizontal and vertical screen coordinates and aaa... is the string of characters to be displayed. For example, the command A 5 8 GRAPHICS will display the word "GRAPHICS" starting at the sixth column of the ninth display line. Valid values of x are 0-31, and 0-15 for y. If the character string is too long to fit on one line, it will be continued on the following line; the command terminates when a carriage return is received. The characters will appear as green on black or orange on black, depending on whether the Invert command is in effect.

R—Reverse Alpha command. This command is identical to the A command, except that the characters appear as black on a green or orange background.

S—Set command. The Set command is used to illuminate a single display element on the screen by specifying the desired x and y coordinates in the format S x y; the valid ranges for x and y vary according to the mode being used, and range from 0 to the maximum number of display elements for that mode in the x or y direction minus 1. When using either of the semigraphics modes, a P command must be issued before the S command to turn on the desired seg-



A 3-D picture in mode 9 using the Sublogic graphics package.



EACH BLOCK REPRESENTS ONE BYTE
HEXADECIMAL OR TWO ASCII CHARACTERS

Fig. 2. Motorola S1-S9 record format.

ments of the display element. The resulting value of P will remain in effect for all subsequent S commands until another P command is issued. A C command will determine the color displayed by S commands that follow.

H—Horizontal Line command. Using the format H x y l, the H command will display a horizontal line starting at the specified x and y coordinates for a length of l. The maximum values of x, y and l depend on the mode selected with a prior M command, but any value above the allowable limit will be automatically truncated to the maximum. As with the S command, a P command should be issued first to set the desired element pattern when in the semigraphics modes.

V—Vertical Line command. Same as the H command, except that it displays a vertical line using the command format of V x y l.

LD*—Load command. This command can be used to load machine-language programs into the optional program RAM to provide additional software routines, and can also load properly encoded display data directly into the display memory, causing it to appear on the screen. For example, instead of using the Color and Set commands to illuminate points on the screen, you could load a bit pattern for the desired color into the display memory address corresponding to a specific screen location.

Data entered with the LD* command must be in Motorola S1-S9 ASCII-hexadecimal format, as shown in Fig. 2. All fields in the S1 and S9 records are in ASCII-hexadecimal format, meaning that two ASCII characters are used to represent one byte in hexadecimal notation (i.e., a one-byte field containing F6 in hex would be entered via the input device as F and 6, thereby allowing hexadecimal data to be entered on an ordi-

nary ASCII keyboard). After the LD* command is entered, the Electric Crayon will read S1 and S9 records from the keyboard or computer into memory, and then either begin executing the program that was entered or return to EGOS and wait for more commands.

Data to be entered must be in the S1-S9 record format, wherein each record consists of a type code (S1 or S9), a count field, an address field, a checksum and, in the case of S1 records, a variable-length data field. The first field in a record must be either S1 for a data record or S9 for a trailer record, and the second must be a count field containing the total number of hex bytes in the address field (2), the data (variable) and itself (1). The third field is a two-byte address field, indicating the load address for the following data if in an S1 record, or an address where the Electric Crayon should begin execution if in an S9 record. If an S9 record contains an address field of all zeros, control will return to EGOS. The fourth field in an S1 record contains the data to be loaded; all of the data does not have to be contained in one record, but may be continued in several S1 records. The number of data bytes per record is arbitrary. The final field is the checksum byte, which is used for detecting errors during loading. It contains the complement of the eight-bit sum obtained when all of the data bytes, address bytes and count bytes are added together, with any carries out of the high-order position ignored.

As the records are read into the Electric Crayon, EGOS totals up its own checksum and adds it to the checksum in the input record. If there are no loading errors, the sum should be zero, since the checksum in the record was complemented prior to being output. If an error does occur, EGOS will print "LOAD ER-

ROR" on the display screen and await more commands. Loading stops when an S9 trailer record is read, and control passes to the address in the record or to EGOS if that address is zero.

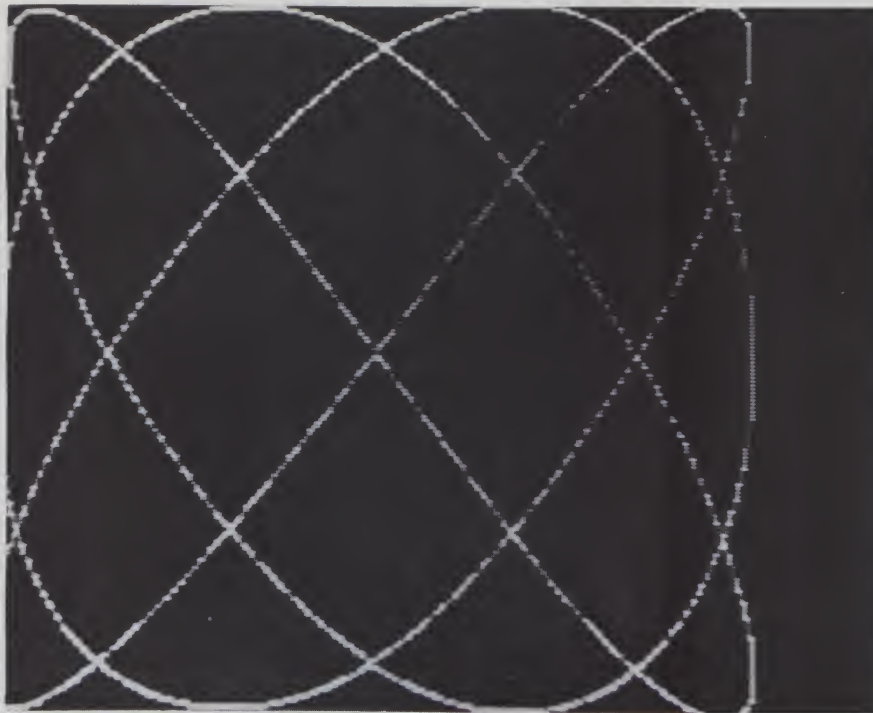
Hardware Interfacing

If you want to connect the Electric Crayon to a Radio Shack TRS-80 computer, interfacing is a snap; although no connection cable is included with the Electric Crayon, two different cables for the TRS-80 are available from Percom. Both cables let you connect the unit to a TRS-80 in place of a printer, with one cable plugging into a TRS-80 expansion interface and the other connecting to the TRS-80 printer interface cable. In either case, the LPRINT command in BASIC is used to send commands to the Electric Crayon via the printer port. The procedure is thoroughly explained in the manual supplied with the Electric Crayon.

Connecting the unit to a parallel output port on another type of computer is a bit more involved, but still not too difficult. You must first become familiar with the pin assignments for channel A of the Crayon's computer port (Appendix A1 in the Electric Crayon manual). The signals at this port are the eight data lines, D0 through D7, which accept data from the external computer, and two control lines labeled STROBE and BUSY.

The first, STROBE, is an input signal sent from the external device's output port indicating that valid data is present on the data lines. Most popular I/O boards for various computers have this signal present on each parallel output port; this signal must be negative true; that is, it goes low to indicate data present.

The second line, BUSY, is an output signal from the Electric Crayon to indicate that it cannot accept input data and that the computer should wait until the line goes low before sending anything. This signal should be connected to one data line of an input port that is used as a status port by the computer; again, most I/O boards include a status port. If your computer's parallel output port has an acknowledge input for accepting a handshaking signal from the external device, it should be enabled by tying it to +5 V dc. A simple program that waits to transmit data to the Crayon until the BUSY line is low is shown in Listing 2, written in 8080 assembly language.



Mode 9 graphics—a Lissajous figure plotted with a BASIC program.

Although the manual gives pin numbers on the rear panel connector for each signal, it makes no mention of how the pins are located on the connector. Viewed from the rear of the chassis, the computer port connector is on the right, with the auxiliary port connector on the left. The computer port connector is a card-edge type having 17 pins on each side, with pin 1 being the leftmost pin on the underside of the board. Pin 2 is above pin 1 on the top of the board; thus, all odd-numbered pins are on the bottom and even-numbered pins on top.

A suitable connector is the AP Products 924064-36-R, which comes attached to 18 inches of ribbon cable and is available from most large mail-order parts outlets. Any similar connector with 0.100-inch pin spacing should also work. The auxiliary port requires a 40-pin card-edge connector, also with 0.100-inch spacing. Pins 31, 32 and 33 on the computer port connector are grounded, and one of these should be connected to a ground on the computer.

Alternately, a bare-bones graphics system can be set up by attaching an ASCII keyboard to the Electric Crayon computer port. Simply attach each of the data lines from the keyboard to the corresponding line on the port and connect the keyboard STROBE output to the STROBE input on the

port. You can then type commands to the Electric Crayon on the keyboard. While this method is not as elegant as attaching a computer, it is a good start.

Video Connections

If you have a video monitor, connection to the Electric Crayon requires only an F59 connector, a length of RG-59/U coax cable and a connector to fit the video input on the monitor. Instructions are furnished for converting the Electric Crayon to output a UHF signal so that it can be connected to the antenna terminals of a TV set, but this requires cutting components from the circuit board and would be difficult to reverse.

Instead, I recommend using an inexpensive rf modulator such as the Pixie-verter by ATV Research, which connects between the video output on the Electric Crayon and the anten-

na terminals on the TV set. This lets you use either a TV set or a monitor, the latter producing higher resolution with the denser graphics modes. A monitor also will eliminate interference caused by stray signals from the computer that tend to sneak in through the antenna terminals and garble the picture.

If you do use a modulator, be sure to disconnect the antenna from the TV set to prevent broadcasting your signal to other nearby sets; you might think computer graphics are fascinating, but your neighbors may not share your enthusiasm!

Software Interfacing

If you have a TRS-80 and have connected the Electric Crayon to its printer port according to the instructions in the manual, all that you have to do to talk to the Crayon is use the LPRINT BASIC statement to send commands to the printer port. For example, the statement LPRINT "ERS" would erase the display screen.

If your computer is not a TRS-80, things get a little stickier. The easiest approach is to use a version of BASIC that includes an LPRINT statement and then connect the Electric Crayon to the printer port. This approach is a bit inconvenient, however, if you have a printer and must switch devices whenever something needs to be printed.

A more elegant approach is possible if your BASIC includes a POKE statement and you know where the I/O driver routines are located in memory. Connect the Crayon to a separate port, then include a BASIC subroutine in your program to POKE the Electric Crayon port numbers and status port mask bits into the I/O driver routine for the printer, so that output from the LPRINT statement goes to the Crayon port instead of the printer. A similar subroutine would POKE the original values back in to access the printer (see Listing 3 for an example of this method).

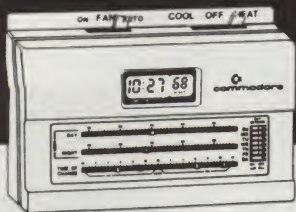
```

*      THIS ROUTINE IS CALLED WITH THE CHARACTER TO BE SENT
*      TO THE ELECTRIC CRAYON IN REGISTER B.
*
*
1000 DB05  SEND:  IN      05      ;READ CRAYON STATUS PORT
1002 E680      ANI      80H      ;IS THE CRAYON BUSY?
1004 C20010     JNZ      SEND     ;YES, WAIT
1007 78        MOV      A,B      ;GET CHAR. TO BE SENT
1008 D308      OUT      08      ;SEND IT TO CRAYON
100A C9        RET              ;RETURN TO CALLER

```

Listing 2. Routine that waits for the Crayon's busy line to go low before sending a character.

Save money... Save energy
Cut your fuel bills with the new
Commodore
Programmable Thermostat



Easy to install ... in your present 24-volt heating/cooling system — in minutes — using only a screwdriver.

Easy to program ... for up to 4 temperature changes each day with dual set back feature.

Easy to operate ... with exclusive slide controls for both time and temperature.

Features continuous LCD read-out of time, temperature, day of week ... 7-day clock ... exclusive sliding lever controls ... "Day Skipper" switches ... complete instructions.

Commodore Thermostat — pays for itself in fuel savings in a year or less!

Get it today ... start saving tomorrow

Circle our Reader Service # for brochure

\$129.95 includes shipping

marketed by:



Random Access, inc. ✓ 142

PO Box 1555 South Bend IN 46624

Order and Information Line

219-277-8844



COD's accepted

Desk Main/Frame Desk Main/Frame

LOW COST & ATTRACTIVE STYLING

- MAIN/FRAME INTEGRATED INTO FURNITURE QUALITY DESK
- ELECTRONICS PACKAGE SLIDE MOUNTED FOR EASY ACCESS
- SUPPORTS TWO 8" FLOPPY DRIVES FROM SEVERAL MANUFACTURERS (DRIVES NOT INCLUDED)
- 10 SLOT MOTHERBOARD INCLUDES CONNECTORS
- POWER SUPPLY FOR DRIVES AND CARDS
- DESK AND MAIN/FRAME AVAILABLE SEPARATELY
- MATCHING PRINTER DESK AVAILABLE



WRITE OR CALL FOR OUR BROCHURE WHICH INCLUDES OUR APPLICATION NOTE: 'BUILDING CHEAP COMPUTERS'

INTEGRAND ✓ 77

8474 Ave. 296 • Visalia, CA 93277 • (209) 733-9288
We accept BankAmericard/Visa and MasterCharge



BW-2630 Battery Tool



BW-2630 \$19.85*

BT-30 \$ 3.95*

BT-2628 \$ 7.95*

BW-2630 BATTERY TOOL

The new BW-2630 is a revolutionary battery powered wire-wrapping tool. The tool operates on 2 standard "C" size NiCad batteries (not included) and accepts either of two specially designed bits. Bit model BT-30 is for wrapping 30 AWG wire onto .025" square pins; BT-2628 wraps 26-28 AWG wire. Both produce the preferred "modified" wrap.

Designed for the serious amateur, BW-2630 even includes both positive indexing and anti-overwrapping mechanisms — features usually found only in industrial tools costing five times as much. Pistol grip design and rugged ABS construction assure performance and durability. In stock at local electronic retailers or directly from

OK Machine & Tool Corporation

3455 Conner St., Bronx, N.Y. 10475 U.S.A.

Tel. (212) 994-6600 Telex 125091 ✓ 62

* Minimum billings \$25.00, add shipping charge \$2.00
New York State residents add applicable tax


```

*          THIS ROUTINE IS CALLED WITH THE CHARACTER
*          TO BE PRINTED IN REGISTER C
*
7E36 DB03  LIST:  IN    03      ;READ STATUS PORT
7E38 E601      ANI    01      ;CHECK STAT FOR READY TO PRINT
7E3A CA367E    JZ     LIST    ;NOT READY, WAIT
7E3D 79        MOV    A,C     ;GET CHARACTER
7E3E D302      OUT    02      ;OUTPUT IT TO PRINTER PORT
7E40 C9        RET           ;RETURN TO CALLER

```

A. The Standard CP/M Line Printer Routine

```

REM      THIS ROUTINE MODIFIES THE CP/M LINE PRINTER
REM      OUTPUT ROUTINE TO ROUTE OUTPUT FROM LPRINT
REM      STATEMENTS IN CBASIC TO THE ELECTRIC CRAYON
REM
POKE 7E37H,05H  REM CRAYON STATUS PORT
POKE 7E39H,80H  REM CRAYON STATUS BIT MASK
POKE 7E3AH,0C2H REM INVERT JMP INSTRUCTION
POKE 7E3FH,08H  REM CRAYON OUTPUT PORT

```

B. The BASIC Statements Needed To Modify The Routine

```

*          THIS ROUTINE IS CALLED WITH THE CHARACTER
*          TO BE SENT TO THE CRAYON IN REGISTER C
*
7E36 DB05  LIST:  IN    05      ;READ ELECTRIC CRAYON STATUS PORT
7E38 E680      ANI    80H      ;IS THE CRAYON BUSY?
7E3A C2367E    JNZ    LIST     ;YES, WAIT
7E3D 79        MOV    A,C     ;GET CHARACTER
7E3E D308      OUT    08      ;OUTPUT IT TO CRAYON
7E40 C9        RET           ;RETURN TO CALLER

```

C. Source Listing Of The Result

Listing 3. Using the POKE statement in BASIC to modify the line printer driver.

If your BASIC has POKE but no LPRINT statement, use the above scheme to modify the console output routine so that output from the PRINT statement will be sent to the Electric Crayon. A similar approach can be applied to other languages, such as FORTRAN. Of course, commands can be sent to the Crayon from assembly-language programs, but numeric values (such as x-y coordinates) must be converted to ASCII character strings for transmission to the unit. For versatility and easy implementation, BASIC is the way to go.

Observations

Having used the Electric Crayon for several weeks with a variety of applications, my experiences thus far have been quite favorable. I phoned my order directly to Percom (they accept credit cards), and received the unit in about five weeks.

After reading the manual and connecting the Crayon to my monitor, I threw the power switch and rejoiced as the sign-on message flashed on the screen. I then spent several hours connecting the unit to a parallel port

on my computer, a souped-up Altair 8800, and writing some simple software driver routines.

As I mentioned, the manual is a bit vague concerning interfacing to anything other than a TRS-80, so some trial and error was necessary. The manual does contain a good section on familiarization with the EGOS commands and includes some simple demonstration programs. I have had good results driving the Electric Crayon with programs written in CBASIC using the CP/M operating system, by poking modifications into the CP/M printer output routine as shown in Listing 3. The Crayon's semigraphics modes are ideal for drawing colorful bar charts and graphs using values calculated with BASIC programs, while mode 9 is great for plotting equations. I have also had excellent results driving the Electric Crayon with the BASIC language 3D graphics package from Sublogic. The package is well-documented and, coupled with the Crayon, is a very good tool for learning computer graphics concepts.

I found fault with only two aspects of the Electric Crayon's performance.

The first is that the ERS command flashes garbage on the screen for an instant before erasing the display. This is only a minor annoyance unless you want to erase the screen between frames of an animated display. The second is that the time required to draw lines using the H and V commands in the denser graphics modes is rather high; several seconds are required to draw long lines in mode 9, which is bad news for animated displays.

One solution is to load the display data directly into the Electric Crayon's display memory with the LD* command, producing an almost instantaneous result. The catch is that you have to write some rather complex assembly language routines to calculate load addresses, data content and checksum, and convert everything to ASCII-hexadecimal format for transmission to the Electric Crayon.

Conclusion

To sum up, I am generally pleased with the Electric Crayon; it's a good buy for the money. The documentation is well-written and, with the aforementioned exceptions, complete and helpful. The schematic diagram and theory of operation provided help unravel the mysteries of the Crayon's innards, and the source listing of EGOS is invaluable for the software hackers. The unit is powerful enough to be a stand-alone graphics computer with its four I/O ports and provision for adding program and read-only memory. With a little imagination, the possibilities are almost endless. Happy coloring! ■

Additional Resources

- A 3D Microcomputer Graphics software package written in BASIC as well as various assembler languages is available from Sublogic, Box V, Savoy, IL 61874. The cost is quite low and the extensive documentation does a good job of explaining the basics of computer graphics.

- The Pixie-verter from ATV Research, 13-B Broadway, Dakota City, NE 68731, is a good rf modulator for use with the Electric Crayon. It costs about \$10 and is available from many dealers.

- The TV Typewriter Cookbook by Don Lancaster, published by Howard Sams, contains detailed instructions on adding a direct video input to an ordinary TV set.

Using the LD* Command

This example explains the S1 and S9 records required to draw a line on the display screen by loading picture data directly into the Electric Crayon's display memory. Specifically, a blue line eight blocks long will be drawn across the top of the screen using mode 1 semigraphics. Under mode 1, one byte of display memory is needed for each display block on the screen, since both color and semigraphics pattern information must be present. This data is encoded in each mode 1 display byte as follows:

$C_1 C_0 P_5 P_4 P_3 P_2 P_1 P_0$

where C_1 and C_0 select the color, and P_5-P_0 select which of the six segments of each semigraphics block are illuminated. This information is contained in the Motorola applications notes for the MC6847, available from Motorola distributors.

In this example, we will select blue with all segments illuminated, which is encoded like this:

1 0 1 1 1 1 1 1

Therefore, each of our bytes in display memory will contain 10111111 in binary, or BF in hexadecimal.

We want to draw our line across the top of the screen starting at the leftmost position for a length of eight display blocks, which will require eight bytes in the Crayon's display memory. According to the Electric Crayon manual, the display memory starts at address

D000 in hex, beginning in the upper left-hand corner of the display. Since there are 512 block positions on the screen in mode 1, and each block requires one byte of memory, the last position on the screen is at address D1FF. This block is in the lower right-hand corner of the screen. Our eight-block line will use addresses D000 through D007.

We can now begin building our S1 data record. The first two bytes are the record type, S1. The second two are the count field, containing the number of *hex* bytes encoded in the count, address and data fields. In our example there are eight data bytes, plus two bytes for the address field and one for the count field itself. Thus, we have $8 + 2 + 1 = 11$, or 0B in hex. After converting to ASCII, the characters 0 and B are placed in this field. The next field in the record is the load address, which in this case is D000; the four ASCII characters D000 are inserted here. The eight data bytes are next, again expressed in ASCII as B and F repeated eight times, for a length of 16 bytes.

Now for the hard part: the checksum. It is calculated by adding together the data bytes, address bytes and count byte as an eight-bit sum, with carries out of the high-order bit ignored; the total is then complemented by making each zero bit 1 and each one bit 0, converted to two ASCII characters and placed in the record. Note that the hexadecimal values for the fields are added together before they are converted to ASCII characters.

In our example, we will add the count byte (0B), the address bytes (D000) and the eight data bytes as follows:

$0B + D0 + 00 + BF + BF + BF + BF + BF + BF + BF + BF$

giving a total of D3 if high-order carries are dropped. The complement of D3 is calculated to be 2C by inverting each bit. This value is converted to ASCII 2 and C and placed in the record. The checksum is most easily calculated using an assembler language routine that zeros an eight-bit accumulator, adds each byte to it, and then takes the complement (the 8080 assembler language instruction to do this is CMA, with the Z-80 equivalent being CPL). The complete ASCII S1 record appears as follows, with a length of 26 bytes: S10BD000BFBFBFBFBFBFBFBF2C

The same rationale is used to construct the count, address and checksum for the S9 trailer record; the zero address field returns control to EGOS after the record is read. The S9 record appears below:

S9030000FC

The commands that need to be entered to draw our line are as follows:

M1 (Set Mode 1)

ERS (Clear Screen)

LD* (Load)

S10BD000BFBFBFBFBFBFBFBF2C

S9030000FC

Although this method is much more cumbersome than using EGOS commands to draw displays, it is faster and is ideally suited to assembler language driver programs.

MOVING?

Let us know 8 weeks in advance so that you won't miss a single issue of *Kilobaud Microcomputing*. Attach old label where indicated and print new address in space provided. Also include your mailing label whenever you write concerning your subscription. It helps us serve you promptly.

- | | |
|---|---|
| <input type="checkbox"/> Address change only | <input type="checkbox"/> Payment enclosed |
| <input type="checkbox"/> Extend subscription | (1 extra BONUS issue) |
| <input type="checkbox"/> Enter new subscription | <input type="checkbox"/> Bill me later |
| <input type="checkbox"/> 1 year \$18.00 | |

If you have no label handy, print OLD address here.

AFFIX LABEL

Name _____ Call _____

Address _____

City _____ State _____ Zip _____

print NEW address here:

Name _____ Call _____

Address _____

City _____ State _____ Zip _____

Kilobaud Microcomputing P.O. Box 997 • Farmingdale NY 11737

How's your love life?

A little dull around the edges? Routine? Predictable? Boring? Maybe all it needs is a little Interlude. Interlude is the most stimulating computer game ever conceived. It combines a computer interview, an innovative programming concept, and a one-of-a-kind manual to turn your love life into exciting, adventurous, delicious fun!

Interlude is: romantic...playful...outrageous...a fantasy. Interlude is: ■ A Bed of Roses (Interlude #1) ■ Mata Hari (Interlude #49) ■ The Chase (Interlude #7) ■ Rodeo! (Interlude #71) ■ The King and I (Interlude #60) ■ Some Enchanted Evening (Interlude #84) ■ Caveman Caper (Interlude #82) ■ From Here to Ecstasy (Interlude No. 30) ■ Satin Dreams (Interlude #72).

More than 100 Interludes are included in the program. Most are described in detail in the accompanying manual, but several surprise Interludes are buried in the program awaiting that very special time when your interview says you're ready. (When you learn secret Interlude #99, your love life may never again be the same!) Interlude can give you experiences you'll never forget. Are you ready for it?

Interlude™
The Ultimate Experience.

INTERLUDE, 10428 Westpark, Houston, Texas 77042. I'm really ready. Send my Interlude today.

Apple II (16K)*

- ☐ Cassette (\$16.95)
- ☐ Diskette (\$19.95)
- ☐ Diskette—Pascal or DOS 3.3 (\$19.95)

Add \$1.50 for shipping and handling.

☐ **MASTERCARD**

Account No. _____

TRS-80 (Level II-16K)**

- ☐ Cassette (\$16.95)
- ☐ Diskette (\$19.95)

☐ **VISA**

All charge customers must sign here. _____

Expiration date _____

Available for immediate shipment.

Please enclose your check payable to INTERLUDE or complete the charge information:

MasterCard Bank Code _____

CHARGE CUSTOMERS: Order by phone toll-free! **1-800-231-5768 Ext. 306** (Texas: 1-800-392-2348 Ext. 306)

Name _____

Address _____

City _____

State _____

Zip _____

*Apple II is a registered trademark of Apple Computers, Inc. **TRS-80 is a registered trademark of Radio Shack, a Tandy Co.

Dots Incredible!

By James J. Conroy

"You, sir!—define a character!" For the computerist who is lucky enough to have a dot-matrix printer, this command may just be the key to hard copy that ranges from graphics to foreign language scripts.

The dot-matrix printer system arrived on the scene some years ago and brought a new dimension to hard copy: user-defined character (UDC) sets.

Unlike a fixed-type element printer (such as a typewriter with type bars or a type ball), the dot-matrix mechanism uses a single moving print head with an array of holes, through which solenoid driven wires can protrude. By intelligent selection of the impact of these wires, the entire American Standard Code for Information Interchange (ASCII) character set is produced. Typically, the matrix of the print head has a dimension of 5 by 7 or 7 by 9. This means that the print head has one bank of seven wires that prints five columns to form a character (or for the 7 by 9 matrix, nine wires and seven columns). The permutations—or possible combinations—of dot configurations that could conceivably be produced are described in Table 1.

That's a lot of possible characters, and, for the most part, we are only using a subset of 96 characters—the ASCII set! So what about all the rest of the character configurations? Well, some printer manufacturers have opened the door to using the whole matrix by letting the programmer ac-

cess and control the print head.

How It Is Done

The manner in which a programmer is empowered to produce user-defined characters can vary from one machine to the next. For our purposes, we will consider the methodology set forth for the new Base 2 printer. This compact and versatile unit is one of the most pleasing combinations of low cost and high performance I have seen. In addition to the options available to enhance the performance of this little marvel, the UDC feature comes as a standard item. (As do the full upper/lower ASCII set, elongated characters, immediate interface capability for the four most popular interface modes

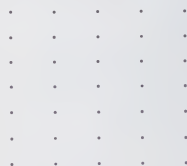


Fig. 1. A wire can impact and produce a dot in any or all of the positions.

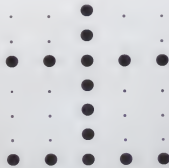


Fig. 2. This design produces a "plus or minus."

and a host of other desirable features.)

As with most other dot-matrix printers, the Base 2 uses resident software (usually referred to as firmware) to define and control the print head's configuration of the print characters. In fact, provisions are included in its design for the easy installation (via IC sockets) of additional EPROM chips to boost the number of on-board character sets to anywhere from four to eight sets. Base 2, Inc. (1835A Dawns Way, Fullerton, CA 92631), currently offers four sets in EPROM and plans for more.

To create and use your own character set, the following steps must be taken:

- Design and define the characters you want to produce. The result is a series of data statements which must be transmitted to the printer.
- Transmit the data to an allocated memory in the printer (RAM).
- Switch to your user-defined characters (when required) by a special control code.
- Switch back to standard characters (by control code) as necessary.

Let's go into a little more detail for each step to see how easy it is.

Design and Define

It was a pleasant surprise to find out how simple it is to design a character for the Base 2 printer. Begin by envisioning the print matrix configuration. Basically, it looks like Fig. 1. Each dot represents a position where a wire can strike to produce an impression. Therefore, you must decide which pattern of impressions will create an image of your desired char-

$$\begin{aligned} 5 \times 7 &= 35 \text{ dots (on or off)} = 2 \text{ to } 35\text{th power} = 3.43597 \times 10^{10} \\ 7 \times 9 &= 63 \text{ dots (on or off)} = 2 \text{ to } 63\text{rd power} = 9.22339 \times 10^{18} \end{aligned}$$

Table 1.

Address correspondence to James J. Conroy, 57 E. Garrison St., Bethlehem, PA 18018.


```

35 REM THIS SETS PRINTER UP FOR FEEDING DATA
40 LPRINT CHR$(27);CHR$(75)
45 REM THIS READS AND FEEDS DATA
50 FOR C=1 TO 48
60 FOR A=1 TO 10
70 READ X
75 X=X+128
80 LPRINT CHR$(X);
90 NEXT A
100 RESTORE
110 NEXT C
115 REM THIS TESTS STANDARD CHARACTERS
120 LPRINT"ABCDEFGH IJ"
130 LPRINTT CHR$(27);CHR$(76)
135 REM THIS TESTS UDC
160 LPRINT "ABCDEFGH IJ"
500 DATA 0,0,0,0,0,68,68,127,68,68

```

Listing 1.

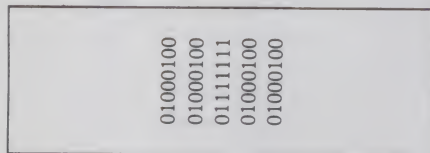


Fig. 3. Ones now represent dots, and zeros represent spaces.

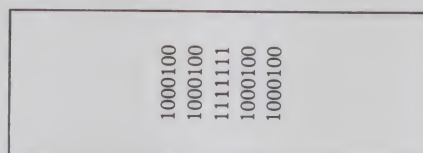


Fig. 4. An extra zero has been added at the bottom of each column to make eight-bit binary numbers.

acter.

For example, consider the design of the non-ASCII character for the mathematical term "plus or minus." In Fig. 2, the appropriate dots have been marked to produce this symbol. To encode this into a data statement that will define this symbol for the printer to store in its memory, you can imagine the same design with zeros for blank spaces and ones for dots. (See Fig. 3.)

Does this remind you of anything? What we have now are five columns that represent binary numbers! This is the key to forming the necessary data statement to define this character. It will be convenient to consider each column as an expression of an eight-bit binary number. Bit number 8 will always be zero (imagine one more zero under each column). If you turn Fig. 4 90 degrees clockwise, you can easily see the binary numbers which define this character. Since the Base 2 printer has built-in provisions for one-dot intercharacter spacing, you need only concern yourself with the construction of the character itself.

To actually write the data statement, you must consider the decimal

equivalent of these five binary numbers. It turns out that for this design, you really only have two different numbers. They are

01000100 = 68

01111111 = 127

Therefore, the data statement should read:

```
500 DATA 68,68,127,68,68
```

This will define your single character.

Transmit

You are now ready to transfer the information in the data statement to the printer. The printer will store the data in its RAM, which is set aside for this purpose. To transmit the character definitions (or, for that matter, any information or command) to the Base 2, employ the LPRINT CHR\$(X) command from BASIC. In my talks with the Base 2 people (who were quite helpful and courteous), I learned that the BASIC software control codes may vary from one computer to the next. What I am relating are the commands for a Base 2/TRS-80 interfacing. The general idea is the same for other Base 2/computer interfaces.

You must always advise the Base 2

printer that a command or information is being sent. The command code for this is LPRINT CHR\$(27). This must *always precede* any instruction which you are going to send. The next command—LPRINT CHR\$(75)—is the code that tells the Base 2 that you are about to load data into the UDC/RAM. These two commands would be expressed in the BASIC statement as:

```
40 LPRINT CHR$(27);CHR$(75)
```

Now you want to transmit the character defining data, so you must READ the data statement and LPRINT the data values in CHR\$(X) form. A sample program might be:

```

50 For A=1 TO 5
60 READ X
70 LPRINT CHR$(X)
80 NEXT A
500 DATA 68,68,127,68,68

```

You are almost there. You must take into consideration one more factor. When implementing the UDC feature of the Base 2 printer, you cannot just send five elements of data down the line to the printer memory. You must fill up the entire UDC/RAM, even if you don't have that many characters to define. There is space in the memory for 96 characters (at five data elements per character), so you must send 480 elements of data to the printer. The logical choice is to fill the remaining area in the memory with data that defines the "space" character. In our situation, it might be nice to have spaces in between our "plus or minus" character (for test purposes), so you can change the data statement to read:

```
500 DATA 68,68,127,68,68,0,0,0,0,0
```

This defines your designated character and a "space." You should further modify the program to transmit this data (for two characters) 48 times. Remember: 48×2 characters (five data elements each) = 96 characters (480 elements of data). The program now reads:

```

40 LPRINT CHR$(27);CHR$(75)
50 REM WE HAVE TO FILL UDC/RAM
  WITH 96 CHARACTERS
60 FOR C = 1 TO 48
70 REM WE NOW HAVE 10 DATA ELE-
  MENTS
80 FOR A = 1 TO 10
90 READ X
100 LPRINT CHR$(X)
105 NEXT A
110 RESTORE
115 NEXT C
500 DATA 68,68,127,68,68,0,0,0,0,0

```

Use It!

You have designed, defined and

ABCDEFGHIJ
± ± ± ± ±

Fig. 5. The final printout.

stored your very own character. Now use it! To do this, you send the command to the printer which enables the UDC set. (Remember, you have a whole set of these buggers!) It is:
LPRINT CHR\$(27);CHR\$(76)

Previous to this command, you are drawing standard characters from the printer's ROM. Now you will be drawing from the UDC/RAM. A good way to see the difference would be to add the following statements to your program:

```
120 LPRINT "ABCDEFGHIJ"
130 REM ENABLE UDC SET
140 LPRINT CHR$(27);CHR$(76)
150 REM THIS SHOULD GIVE US OUR
    "PLUS OR MINUS"
160 LPRINT "ABCDEFGHIJ"
```

Fig. 5 is the printout from the Base 2, displaying our pride and joy. When defining a whole set of different characters, you might, at this point, have to go back and rework your designs. A little trial and error, along with visual comparisons, will finally yield a pleasing end product.

Listing 1 is the program which accomplishes our goal.

Switch

Now you have the character(s) and you can call the UDC set when you need it. Don't forget to switch back to the standard ASCII set for your other output. This is accomplished by the command:

```
LPRINT CHR$(27);CHR$(77)
```

If you remember your switching commands, you can merrily bounce back and forth from standard to UDC to your heart's content. Yes, Virginia, there is even a command to wipe out your creation from the RAM:

```
LPRINT CHR$(27);CHR$(74)
```

Conclusion

By now, visions of possibilities must be popping into your head. What can you define? Almost anything. I'm working on an astrological character set. Next, I'll probably create a UDC set that matches the graphics blocks of the TRS-80 video display. If you come up with something worthwhile, you might want to send a copy to Base 2, Inc. They can even burn an EPROM that will give you your set in a permanent mode. ■

** SPECIAL ** SPECIAL ** TRS-80 ADD ON DRIVES IMMEDIATE DELIVERY

SINGLE SIDED \$225.00
DOUBLE SIDED \$345.00

COMPLETE SYSTEMS
SINGLE SIDED \$365.00
DOUBLE SIDED \$485.00
INCLUDES:
MINI DISK DRIVE
FUSED POWER SUPPLY
VENTED CABINET
CABLE
90 DAY WARRANTY
FACTORY ASSEMBLED
FACTORY TESTED

THESE ARE NEW 5" FD's

I 2 INTERFACE, INC. ✓151
20932 CANTARA ST
CANOGA PARK, CA 91304
(213) 341-7914
VISA AND MASTER CHARGE ACCEPTED

Turn your TRS80-I into business info system. Use our printer or Centronics specify when ordering our software with paper forms for disk drives.

PRINTER MG-I	\$645
EARE DISK DRIVE	\$250
4DRIVE POWER SUPPLY	\$ 99
FLIPPY DISKETTE	\$ 3
16K MEMORY REPLACEMENT	\$ 98
AC VOLTAGE TRANSIENT SUPPRESSOR	\$ 25
WORD PROCESSING WP4/CMD	\$ 79
ADVERTISING TX3/CMD	\$ 79
PURCHASING POS/CMD	\$ 79
INVOICING IVC3/CMD	\$ 79
CUSTOMER LIST CL3/CMD	\$ 79
VENDOR LIST VL3/CMD	\$ 79
PRINTER CONTROL PR/CMD	\$ 39
INVENTORY INV/CMD	\$ 79
QUOTATION QT4/CMD	\$ 79
RFO RFO/CMD	\$ 79
CHECK WRITER CKWRT/CMD	\$ 79
ORDER ENTRY OE/CMD	\$ 79

Tangdata Corporation: 100 Eames Street
Framingham Mass 01701 USA TLX 948318
TEL 617-875-3555 ✓350
ADD SHIPPING HANDLING AND SALES TAX
TRS80 Trademark of RadioShack Tandy

OSI (8K) APPLE TRS-80†



Computers & Gambling Products Magazine

PRESENTS:

PROBABILITY HANDICAPPING DEVICE 1 — A BASIC PROGRAM FOR: HORSE RACE HANDICAPPING!

This incredible program was written by a professional software consultant to TRW Space Systems. This is a complex program carefully human factored for easy use. It is a comprehensive horse racing system for spotting overlays in thoroughbred sprint races. Your computer will accurately predict the win probability and odds line for each horse based on your entries from the racing form. The next day overlaid horses can be spotted on the track tote board. The user's manual contains a complete explanation of overlay betting plus much more useful information. The appendix contains a detailed tab run of a 100 consecutive race system workout showing an amazing 50% return (\$1.50 returned for each \$1.00 flat wager). Includes many features such as error correction, bubble sort, line printer output, automatic keyboard debounce, archiving, etc. The manual may be ordered separately for perusal for \$7.95 and credit.

CHALLENGER 1P, 2P, or 4P 8K VERSIONS Now Available!

Phd-1 User's manual and cassette for:
Apple II (16K), TRS-80 Level II (16K), Challenger (8K) 29.95
TRS-80 or APPLE DISK 34.95

BRAND NEW FROM SDL: WIN AT THE RACES. This thoroughbred handicapping algorithm is based on a currently popular book on thoroughbred multiple regression techniques. Both sprints and routes. All of the features of PHD-1 plus more. This program incorporates the best data entry technique we've ever seen.

32K TRS-80 or APPLE CASSETTE 34.95
32K TRS-80 or APPLE DISK 39.95

BOOKS:
Winning at the Races 21.95 + .75 P&H
Beating the Races with a Computer 14.95 + .75 P&H

Make checks payable to JOE COMPUTER DEPT K ✓247
22713 Ventura Blvd., Suite F, Woodland Hills, CA 91364
CA residents add 6% sales tax
PHONE ORDERS: 213-992-0514

*SEND \$2.00 TO PLACE YOUR NAME ON OUR MAILING LIST
†TRS-80 is a registered trademark of Tandy Corporation.

MISSPELLED WORDS?

WordSearch (tm) can find them quickly and reliably. WordSearch is the ideal companion for your CP/M compatible editor or word processing system. WordSearch completes the job that these word processing tools started.

WordSearch is a sophisticated interactive menu driven application that can be tailored to fit your system, terminal and working vocabulary. WordSearch allows for an unlimited vocabulary size without being constrained by language or special subset. Available user system disk storage capacity is the only consideration.

WordSearch is EASY to use. Defaults can be reset at any time as either a permanent or temporary condition thus avoiding almost all redundant or otherwise unnecessary keystrokes.

WordSearch is available now for \$195.00 from



KEYbits

INCORPORATED

P.O. Box 592293
Miami, Florida 33159

MASTER CHARGE (305) 238-3820
and VISA accepted.

CP/M is a registered trademark of Digital Research.

All prices are FOB Miami and subject to change without prior notice.

Copyright (C) 1980 Key Bits Inc.

All rights reserved worldwide.

✓223

Database Manager For the North Star

By John E. Bailey

I've seen a number of database systems described or advertised in different magazines. In each case, I wondered if the system would do what I wanted it to do, or if I would

have to pay a premium price for the few simple functions I was looking for.

To avoid such an unpleasant situation, I decided to write my own.

I took several factors into consideration when designing my system. I didn't want a database that had to have records with unique keys. I also didn't want to be concerned with keeping the records on the database in any particular sequence. To do this, I had to sacrifice access time, since each database request involves a sequential search. But most of the databases I work with are relatively small, so I can live with this longer access time.

I also wanted a system where I could access any number of different databases with one program. I wanted to be able to add records, delete records, update records, search for records by key, scan for records containing a given character string and retrieve records by record number.

All of these considerations led to the development of the database manager system for the North Star described here.

Defining the Database

First, I'll define a hypothetical database to use as an example. Suppose I want a catalog of all the spare parts in my parts box: resistors, capacitors, transistors, integrated circuits and so on. I want each record in the catalog to contain the part number, a description of the part and how many I have on hand.

The part number will be ten characters long. The first two characters of the part number will be type indicator—IC for integrated circuit, TR for transistor, RS for resistor, CP for capacitor and so forth. The other one to eight characters will be the actual part identifier. Thus, the part num-

```
10 REM ***** DATABASE DEFINITION *****
20 REM
30 REM CODED BY JOHN E. BAILEY
40 REM SULPHUR, LA APRIL, 1980
50 REM
60 REM ***** PROGRAM NAME IS "DBDEFN" *****
70 REM
80 P1=11
90 FOR I=1 TO P1:NEXT
100 DIM L$(15)
110 ! " ***** DATABASE DEFINITION *****
120 !
130 INPUT " ENTER NAME OF DATABASE <4 CHARACTERS> ? ",N$
140 IF LEN(N$)>4 THEN 120
150 F$=N$+"DEFN.2"
160 INPUT " DO YOU WANT ME TO CREATE THE DEFN FILE (Y OR N) ? ",Z$
170 IF Z$<>"Y" THEN 190
180 CREATE F$,4
190 OPEN #1:F$
200 L=0
210 IF Z$="Y" THEN 230
220 READ #1 %0,L
230 INPUT " ENTER TOTAL RECORD LENGTH ? ",R
240 INPUT " ENTER START POSITION OF KEY ? ",K0
250 INPUT " ENTER STOP POSITION OF KEY ? ",K9
260 INPUT " ENTER POSITION OF DELETE FLAG ? ",D9
270 WRITE #1 %0,L,N$,R,K0,K9,D9
280 FOR I=1 TO 11:NEXT
290 ! " BEGIN RECORD DEFINITION PHASE ....."
300 !
310 ! " YOU MAY ENTER UP TO 15 CHARACTERS FOR EACH LABEL."
320 ! " YOU MUST ALSO ENTER THE START AND STOP POSITION"
330 ! " FOR EACH FIELD IN THE RECORD."
340 !
350 I=1
360 L$=""
370 ! " ENTER LABEL ".I." ? ",
380 INPUT " ",L$(1,15)
390 IF L$(1,3)="END" THEN 430
400 ! " ENTER START POSITION FOR ".L$." ? ",
410 INPUT " ",S
420 ! " ENTER STOP POSITION FOR ".L$." ? ",
430 INPUT " ",P
440 WRITE #1,L$,S,P
450 I=I+1
460 !
470 GOTO 360
480 CLOSE #1
490 FOR I=1 TO P1:NEXT
500 INPUT " DO YOU WANT ME TO CREATE THE DATA FILE (Y OR N) ? ",Z$
510 IF Z$<>"Y" THEN 560
520 ! " INPUT " HOW MANY LINES ITEMS IN DATABASE ? ",P
530 D$=N$+"DATA.2"
540 M=INT(R*P/256)+4
550 CREATE D$,M
560 ! " ***** END OF DATABASE DEFINITION PHASE *****
570 !
580 END
```

Listing 1. Database definition program DBDEFN.

John E. Bailey, 1100 Post Oak 1, Sulphur, LA 70663.

bers will look like this: IC7404, RS220K and CP.02MF.

I'll also let the part number be the record key. Each record will contain a 15-character description and two characters to indicate the quantity on hand from 00 to 99. I also need to define a one-character field to be the delete flag. The part number will be in position 1 through 10 of the record, the description in position 11 through 25, the quantity on hand in position 26 and 27 and the delete flag in position 28. The total record length will be 28 characters.

The database consists of two files, one containing the database definition and the other the data. Each database will have a four-character name. For my parts database, the name will be PRTS. The database definition file will be named PRTS-DEFN, and the data file, PRTSDATA. Later you'll see how these names are created by the database programs.

The definition file consists of two sections—the header and the body. The header contains the record number of the next available record, the database name, the record length, the key location and the delete flag location. The definition body contains a variable number of entries. Each entry contains a 15-character label, a start position S and a stop position P. The label names the field that starts in the record at location S and ends at location P. Fig. 1 shows the relationship between the database definition and the database record for the PRTS database.

DBDEFN is the program that creates and maintains the database definition file (Listing 1). P1 is a constant used in each of the programs in the system to define the number of lines on your CRT terminal less 1. The program will ask for a four-character database name, in my case PRTS, which is prefixed to DEFN to form the name of the database defini-

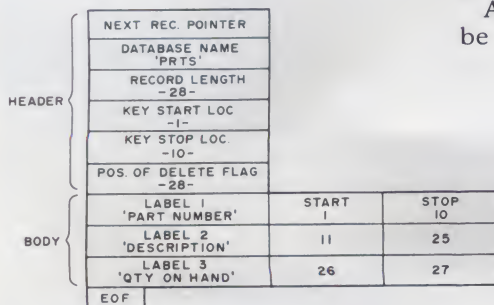


Fig. 1a. Organization of database definition file.

```

***** DATABASE DEFINITION *****

ENTER NAME OF DATABASE (4 CHARACTERS) ? PRTS

DO YOU WANT ME TO CREATE THE DEFN FILE (Y OR N) ? Y

ENTER TOTAL RECORD LENGTH ? 28
ENTER START POSITION OF KEY ? 1
ENTER STOP POSITION OF KEY ? 10
ENTER POSITION OF DELETE FLAG ? 28

BEGIN RECORD DEFINITION PHASE.....

YOU MAY ENTER UP TO 15 CHARACTERS FOR EACH LABEL.
YOU MUST ALSO ENTER THE START AND STOP POSITION
FOR EACH FIELD IN THE RECORD.

ENTER LABEL 1 ? PART NUMBER
ENTER START POSITION FOR PART NUMBER ? 1
ENTER STOP POSITION FOR PART NUMBER ? 10

ENTER LABEL 2 ? DESCRIPTION
ENTER START POSITION FOR DESCRIPTION ? 11
ENTER STOP POSITION FOR DESCRIPTION ? 25

ENTER LABEL 3 ? QTY ON HAND
ENTER START POSITION FOR QTY ON HAND ? 26
ENTER STOP POSITION FOR QTY ON HAND ? 27

ENTER LABEL 4 ? END

DO YOU WANT ME TO CREATE THE DATA FILE (Y OR N) ? Y

HOW MANY LINES IN THE DATABASE ? 150

***** END OF DATABASE DEFINITION PHASE *****

```

Sample run 1. How a database is defined using DBDEFN. The database being defined here is the example PRTS database.

tion file.

If you are running a single disk system, remove the ,2 in line 150. If you are defining a new database, respond Y to line 160. If you want to modify an existing database definition, reply N. Answer each of the questions presented. Type END for the label to end the definition phase. If you want the program to create the data file, respond Y to line 500. The program will create a data file big enough to hold the number of line items you supply in line 520. The name of the data file is the name given in line 130 suffixed by DATA. See Sample 1 for an example of the database definition.

After defining the database, it must be formatted. This is done by

DBFRMT (Listing 2). Entering the name of the database and this program will propagate blanks throughout the entire data file. The actual number of records in the database will be slightly greater than requested in DBDEFN. The next record pointer in the database definition is set to zero. Therefore, this program can be used to reformat an existing database. Normally, though, it would only be run after creating a new database.

Using the Database

After these two steps, the database is ready to use.

First, of course, I load records into the database, using the database

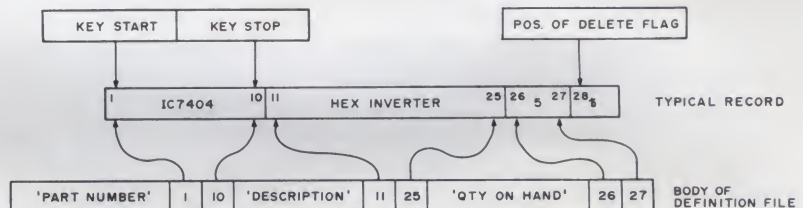


Fig. 1b. Relationship between a record and the database definition file.

manager program DBPROG (Listing 3). It supervises all of the database activities, and is controlled by a menu screen.

Load DBPROG and run it. Type in the database name, and the master

menu will appear. Select option 1 to add records to the database. The program asks for the information by label as the record is defined in the database definition.

At this point you can add as many

records as you want. Remember my previous comments on keys for the example database. If you want to group certain items together, all or the first few characters of the key should be common. For example, all integrated circuits may have a key beginning with IC, resistors beginning with RS and so on. Each time you add a record, the next record pointer in the database definition is incremented by one. Type END at any point to end this phase and return to the menu. Sample 2 shows how records are added to the database.

Records can be added at any time. The location of the next available database record is maintained in the database definition header. If you return via option 1 to add records, the first one will be added at the record that the next record pointer indicates.

Select option 2 to search the database by key. Enter the key you want to search for. You need not enter the entire key. For example, if you enter IC, all records whose keys begin with IC will be retrieved (see Sample run 3). Thus, you can retrieve groups of records with only one access to the database. You can select an alternate key by replying Y to line 740. Enter the starting position in the record of the alternate key. The default key location is reset after each complete access. You may display the entire database by typing ALL for the key.

Records may be routed to the CRT or to the printer. If routed to the CRT, the program pauses after each record is displayed. Press return to continue or type END to stop. If the output is to the printer, there is no pause and the print continues until the end of the database is reached.

You can scan the database for a character string by selecting option 3. Enter the character string you want to scan for. Each record that contains that string will be displayed. The scan process is much slower than the key search and should be used only if a record cannot be retrieved by its key. As before, the program pauses after each record is displayed, and you can type END to stop.

The fastest way to retrieve a record is by record number. You can do this only if you know the physical number of the record you want. Select option 4, enter the record number and it will be retrieved immediately. Record numbers start at 0 and must not be greater than the next record pointer less 1.

```

10 REM ***** FORMAT DATABASE *****
20 REM
30 REM CODED BY JOHN E. BAILEY
40 REM SULPHUR, LA APRIL, 1980
50 REM
60 REM ***** PROGRAM NAME IS "DBFRMT" *****
70 REM
80 P1=11
90 FOR I=1 TO P1:\NEXT
100 !" ***** FORMAT DATABASE *****
110 !
120 INPUT " ENTER NAME OF DATABASE ? ".N$
130 IF LEN(N$)<>4 THEN 110
140 F$=N$+"DEFN,2"
150 OPEN #1.F$
160 READ #1 %0.L.N$.R
170 L=0
180 WRITE #1 %0.L.NOENDMARK
190 CLOSE #1
200 DIM R$(R)
210 R$=""
220 FOR I=1 TO R:R$=R$+" "\NEXT
230 D$=N$+"DATA,2"
240 OPEN #1.D$.L
250 L=INT(256*L/(R+2))-2
260 !" THERE ARE".L." RECORDS IN THE DATABASE."
270 !
280 FOR I=1 TO L
290 WRITE #1.R$
300 NEXT
310 CLOSE #1
320 !" ***** FORMATTING OF DATABASE IS COMPLETE *****
330 !\
340 END

```

Listing 2. Database formatting program DBFRMT.

```

***** DATABASE MANAGER *****

SELECT ONE OF THE FOLLOWING OPTIONS:

1 - ADD RECORDS          5 - UPDATE A RECORD
2 - KEY SEARCH           6 - DELETE A RECORD
3 - CHARACTER SCAN       7 - DISPLAY DBDEFN
4 - RECORD NUMBER        8 - SWITCH DATABASES

ENTER YOUR SELECTION ? 1

PARTS NUMBER ? IC7400
DESCRIPTION ? QUAD NAND GATE
QTY ON HAND ? 4

PARTS NUMBER ? IC7402
DESCRIPTION ? QUAD NOR GATE
QTY ON HAND ? 5

PARTS NUMBER ? RS220K
DESCRIPTION ? 220K OHM RES
QTY ON HAND ? 10

PARTS NUMBER ? CP.01MF
DESCRIPTION ? .01 MF CAP
QTY ON HAND ? 2

PARTS NUMBER ? IC7403
DESCRIPTION ? QUAD AND GATE
QTY ON HAND ? 7

PARTS NUMBER ? END

```

Sample run 2. How to add records to the database (option 1). The program will prompt you to supply information as the record is defined in the database definition. Add as many records as wanted. Type END to return to the master menu.

NEVADA COBOL

For CP/M

Powerful subset of ANSI-74

Why wait?
All the elegant simplicity
of COBOL is now affordable!

\$99⁹⁵
DISKETTE
& MANUAL

REQUIRES only 16K RAM.
Available on 8" CP/M
standard single density or
5¼" diskettes for North
Star, TRS-80 Mod I and
Superbrain. Other formats
too! Manual alone \$24.95.

Ellis Computing
600-41st Avenue
San Francisco, CA 94121
U.S.A.

In CA add sales tax. CP/M trade mark of Digital Research. TRS-80 trade mark of Tandy Corp.

These powerful, easy to use
COBOL APPLICATION PACKAGES
are also available:

- BUDGET PLAN REPORT GENERATOR**
Fantastic time saver and planning aid for beginning or established businesses.
- PERSONAL FINANCIAL REPORTING**
Eye-opening insights of personal spending.
- LABELS** for mailing lists.
- PRECOCOL** (a preprocessor).

ALL 4 in one BOOK!
73 pages with complete COBOL
source code listings and super
documentation.

\$24⁹⁵

✓ 272

WE WELCOME C.O.D.'s



(415) 751-1522

STOP!

CHECK OUR LOW PRICES

COMPUTERS

Altos	
8000-2 64K 2.8" Disks	3939.00
8000-5 64K 2.8" Disks	5239.00
Atari	
400 8K	479.00
800 16K	779.00
810 Disk Drive	559.00
825 Printer (Cent 737)	780.00
Atari Software—LOTS!	LOW!
Dynabyte	
DB 8/1 48K	2295.00
DB 8/1 64K	2695.00
Hewlett-Packard HP85	2750.00
North Star	
HRZ-1 32K DD ASM	1995.00
HRZ-2 32K DD ASM	2295.00
HRZ-2 48K DD ASM	2995.00
Accts. Rec./Payable ea	449.00
General Ledger	775.00
Northword	295.00
Mail Manager	235.00

APPLE PRODUCTS

Apple Computers	CALL
Disk II	CALL
Centronics Parallel Interface	95.50
LOBO 5" w/Controller 3.3	455.00
Pascal Language Card	399.95
Vindex 80 Column Card	279.95
Apple Software—LOTS!	CALL
Calif. Computer Systems	CALL
Mountain Computers	CALL

MONITORS

Leedex 12" B/W	125.00
Sanyo 9" B/W	169.00
Sanyo 12" B/W	265.00
Sanyo 13" Color	394.95

TERMINALS

Hazeltine	
1410	749.00
1420	839.00
1510	1039.00
Televideo	
TVI 912B	698.00
TVI 912C	725.00
TVI 920B	750.00

PRINTERS

Anadex	
DP8000	775.00
DP9000	1259.00
DP9500	1349.00
Base 2	599.00
Centronics	
730-1	599.00
737-1	795.00
700-9	1225.00
Diablo 630	2299.00
Epson MX 80	575.00
NEC Spinwriter	
5510 Ser	2540.00
5530 Par	2540.00
Paper Tiger	
445 NEW!	739.00
445 w/Graphics	799.00
460 NEW!	1076.00
460 w/Graphics	1139.00
Qume 5 45/RO	2499.00
Texas Instruments	
810 Basic	1495.00
820 Basic KSP (Full ASCII 102)	1649.00

TERMS: Master Charge, VISA, M. Order, Cashier Check accepted. COD add 10% deposit. Calif. add 6% tax. FREE delivery on most items. We PROMISE prompt service.

**MAIL
ORDER
ONLY**

RAC PRODUCTS ✓ 188
3200 KNIGHTSWOOD WAY
SAN JOSE, CA 95148 (408) 274-1915

MULLEN Computer Products

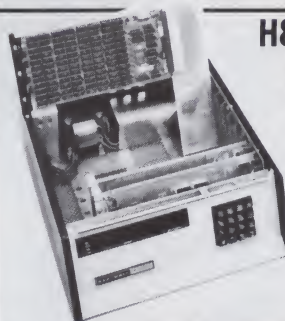
H8

PROTOTYPE BOARD

Now available for the
Heathkit H8 hobbyist.

- Full-sized FR-4 board with heat sink/mounting brackets, buss connectors and polarizing key
- Designed for ease of external cable connection
- All plated thru holes .042" on .1" centers, power and ground traces

HKB-1 H8 PROTOTYPE BOARD \$30. Kit



H8 EXTENDER BOARD

Our HTB-0 lets H8 owners troubleshoot their boards faster and easier. Each board can be extended above the computer for complete access to all circuits and components.

FEATURES

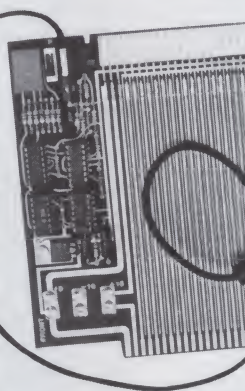
- Sturdy 3/32" board
- Molex 25-pin edge connectors with formed leads for easy scope probe attachment
- Jumper links in power lines makes current measurement and fusing easy

HTB-0 H8 EXTENDER
\$39. (Kit only)

Up-Date

MULLEN Computer Products

S-100 EXTENDER/LOGIC PROBE



- New interlaced ground and signal traces, improves performance, reduces noise, with the new high clock frequency boards
- New brighter display, makes this very handy logic probe easier to use
- New proposed IEEE buss edge connector label, with all the fine quality documentation you expect with Mullen kits.
- High quality FR-4 board is double sided with plated thru holes and solder-masked for easy kit assembly
- Gold on all mating connector surfaces for better electrical contact
- Formed connector leads for easy scope probe attachment
- Jumper links in power lines makes current measurement and fusing easy
- Large "kluge" area lets you build and test your own circuits

S-100 EXTENDER/LOGIC PROBE
\$59. Kit \$79. Assem/tested

S-100 CONTROLLER BOARD

8 relay — OUTPUTS

8 opto-isolator — INPUTS

256 switch selectable addresses

Our S-100 CONTROLLER is used in laboratories, at universities, and in industry, in hundreds of applications, and may be the answer to your control problem. Complete programming and operating instructions included.

For higher power applications a 500W
AC POWER MODULE is available for \$15.

CB-1 CONTROLLER Kit \$129.
Assem/tested \$179.

MULLEN Computer Products

NEW TRS-80* CONTROL BOX

ASSEMBLED BURNED-IN & TESTED, READY TO USE

Special introductory price
M-80 OCTOPORT
\$159. Assem/Tested

- 8 reed relay - OUTPUTS
- 8 opto-isolated - INPUTS
- Selectable port address
- Power supply
- Assembled cable & connectors



Use your TRS-80, and our M-80 control box to program control energy savings devices at home or in your business. Send for our free application notes today.

*TRS-80 is a trademark of Tandy Radio Shack Corp.

PLEASE ORDER KITS BY NAME (H8 OR S-100). SEND TO:
MULLEN COMPUTER PRODUCTS, BOX 6214, HAYWARD, CA 94544
OR PHONE (415) 783-2866. VISA/MASTERCARD ACCEPTED.
INCLUDE \$1.50 FOR SHIPPING & HANDLING. CALIFORNIA RESIDENTS ADD TAX.

Order Direct or Contact your Local Computer Store.

You can update or delete a database record by selecting option 5 or option 6, respectively. You must know the number of the record you want to update or delete. You can find this by doing a key search or scan. The record will be displayed so that you can verify it. To update a record, simply key in the changes you want to make. Press return to in-

dicate no change. Records are not physically deleted from the database. The location of the delete flag is obtained from the database definition. A # is placed in the delete flag location in the record. This logically deletes the record. A record may be reinstated by using the update mode.

Select option 7 to display the database definition header. Select option

8 to switch to another database.

Other Considerations

DBPROG places certain restrictions on the database. No more than 50 labels are allowed; i.e., the database record must not have more than 50 named fields. This number can be increased by changing the dimensioned sizes of S, P and L\$ in line 80. The maximum key length is 60. This is limited by K\$. The maximum record length is 500, limited by E\$.

DBPROG reads the entire database definition into memory at initialization time. This means that only one physical access is made to this file, even though its individual fields are referenced quite often. The variable L is the next record pointer. Each time a record is added to the data-

Listing 3. Database program DBPROG.

```

10 REM ***** DATABASE MANAGER *****
20 REM
30 REM CODED BY JOHN E. BAILEY
40 REM SULPHUR, LA APRIL, 1980
50 REM
60 REM ***** PROGRAM NAME IS "DBPROG" *****
70 REM
80 DIM S(50),P(50),L$(750),K$(60),A$(15),B$(60),E$(500)
90 P1=11
100 FOR I=1 TO P1:\NEXT
110 !
120 !" ENTER NAME OF DATABASE (4 CHARACTERS) ? ".CHR$(7),
130 INPUT "",N$
140 IF LEN(N$)<>4 THEN STOP
150 F$=N$+"DEFN,2"
160 OPEN #1,F$
170 READ #1,L$,X$,R$,K$,D$
180 I=1
190 IF TYP(1)=0 THEN 280
200 READ #1,A$,X$,Y
210 J=(I-1)*15+1
220 S(I)=X
230 P(I)=Y
240 K=J+14
250 L$(J,K)=A$
260 I=I+1
270 GOTO 190
280 J=(I-1)*15+1
290 L$(J)="END"
300 T=I-1
310 D$=N$+"DATA,2"
320 OPEN #2,D$
330 FOR I=1 TO P1:\NEXT
340 F1=0
350 !" ***** DATABASE MANAGER *****
360 !
370 !" SELECT ONE OF THE FOLLOWING OPTIONS : "
380 !
390 !" 1 - ADD RECORDS 5 - UPDATE A RECORD"
400 !" 2 - KEY SEARCH 6 - DELETE A RECORD"
410 !" 3 - CHARACTER SCAN 7 - DISPLAY DBDEFN"
420 !" 4 - RECORD NUMBER 8 - SWITCH DATABASES"
430 !\
440 INPUT " ENTER YOUR SELECTION ? ".N
450 FOR I=1 TO P1:\NEXT
460 ON N GOTO 510,700,1110,1910,1470,1310,1730,470
470 REM ***** CLOSE FILES AND RETURN TO START *****
480 CLOSE #1
490 CLOSE #2
500 GOTO 100
510 REM ***** ADD RECORDS TO THE DATABASE *****
520 E$=""
530 FOR M=1 TO R\E$=E$+" "\NEXT
540 FOR Q=1 TO T
550 J=(Q-1)*15+1
560 K=J+14
570 S=S(Q)
580 P=P(Q)
590 IF S=D$ THEN 640
600 !L$(J,K)," ? ".
610 INPUT "",B$
620 IF B$="END" THEN 330
630 E$(S,P)=B$
640 NEXT
650 WRITE #2 %L$(R+2),E$,NOENDMARK
660 L=L+1
670 WRITE #1 %0,L,NOENDMARK
680 !
690 GOTO 510
700 REM ***** SEARCH DATABASE BY KEY *****
710 K1=K0
720 INPUT " ENTER SEARCH KEY ? ".K$
730 IF K$="" THEN K$="ALL"
740 INPUT " USE ALTERNATE KEY (Y OR N) ? ".Z$
750 IF Z$<>"Y" THEN 770
760 INPUT ".....ENTER START POSITION OF KEY ? ".K1
770 INPUT " DO YOU WANT A HARDCOPY (Y OR N) ? ".Z$

```

ENTER YOUR SELECTION ? 2

ENTER SEARCH KEY ? IC
USE ALTERNATE KEY (Y OR N) ? N
DO YOU WANT A HARDCOPY (Y OR N) ? Y

REC. 0
PART NUMBER : IC7400
DESCRIPTION : QUAD NAND GATE
QTY ON HAND : 4

REC. 1
PART NUMBER : IC7402
DESCRIPTION : QUAD NOR GATE
QTY ON HAND : 5

REC. 4
PART NUMBER : IC7408
DESCRIPTION : QUAD AND GATE
QTY ON HAND : 7

REC. 5
PART NUMBER : IC7432
DESCRIPTION : QUAD OR GATE
QTY ON HAND : 1

REC. 9
PART NUMBER : IC7475
DESCRIPTION : QUAD LATCH
QTY ON HAND : 2

REC. 10
PART NUMBER : IC74193
DESCRIPTION : SYNC COUNTER
QTY ON HAND : 1

ENTER SEARCH KEY ? IC7432
USE ALTERNATE KEY (Y OR N) ? N
DO YOU WANT A HARDCOPY (Y OR N) ? Y

REC. 5
PART NUMBER : IC7432
DESCRIPTION : QUAD OR GATE
QTY ON HAND : 1

Sample run 3. Two examples of retrieving records by key (option 2). The first example shows how each record whose key begins with IC is retrieved when IC is entered for the key. The second example illustrates a method whereby a single record is retrieved when the full key IC7432 is entered.

More

Listing 3 continued.

```

790 IF Z$="Y" THEN H=1 ELSE H=0
790 FOR I=1 TO P1:NEXT
800 M=LEN(K$)-1
810 M=M+K1
820 F=0
830 READ #2 %F*(R+2),E$
840 IF E$(K1,K1)=" " THEN 930
850 IF K$="ALL" THEN 830
860 IF E$(K1,M)=K$ THEN 880
870 GOTO 910
880 GOSUB 970
890 F1=F1+1
900 IF Z$="END" THEN 330
910 F=F+1
920 GOTO 830
930 IF F1>0 THEN 330
940 ! " ***** NO RECORDS FOUND FOR - ",K$
950 INPUT "",Z$
960 GOTO 330
970 REM ***** PRINT SUBROUTINE *****
980 IF E$(D9,D9)<>" " THEN RETURN
990 !#H,"REC.",F
1000 FOR Q=1 TO T
1010 J=(Q-1)*15+1
1020 K=J+14
1030 S=S(Q)
1040 P=P(Q)
1050 !#H,L$(J,K)," : ",E$(S,P)
1060 NEXT
1070 IF H=1 THEN !#H
1080 IF N=5 OR N=6 THEN RETURN
1090 IF H=0 THEN INPUT "",Z$
1100 RETURN
1110 REM ***** SCAN DATABASE *****
1120 INPUT " ENTER SCAN ARGUMENT ? ",K$
1130 INPUT " DO YOU WANT A HARDCOPY (Y OR N) ? ",Z$
1140 IF Z$="Y" THEN H=1 ELSE H=0
1150 FOR I=1 TO P1:NEXT
1160 M=LEN(K$)-1
1170 U=R-M
1180 F=0
1190 READ #2 %F*(R+2),E$
1200 IF E$(K0,K0)=" " THEN 930
1210 FOR I=1 TO U
1220 J=I+M
1230 IF E$(I,J)=K$ THEN 1260
1240 NEXT
1250 GOTO 1290
1260 GOSUB 970
1270 F1=F1+1
1280 IF Z$="END" THEN 330
1290 F=F+1
1300 GOTO 1190
1310 REM ***** DELETE A RECORD FROM THE DATABASE *****
1320 !
1330 INPUT " ENTER RECORD NUMBER ? ",F
1340 IF F<0 THEN 330
1350 IF F>L THEN 1320
1360 READ #2 %F*(R+2),E$
1370 !N!N!
1380 GOSUB 990
1390 !
1400 INPUT " IS THIS THE CORRECT RECORD TO DELETE (Y OR N) ? ",Z$
1410 IF Z$="Y" THEN 1440
1420 FOR I=1 TO P1:NEXT
1430 GOTO 1330
1440 E$(D9,D9)="#"
1450 WRITE #2 %F*(R+2),E$,NOENDMARK
1460 GOTO 330
1470 REM ***** UPDATE A DATABASE RECORD *****
1480 INPUT " ENTER RECORD NUMBER ? ",F
1490 IF F<0 THEN 330
1500 READ #2 %F*(R+2),E$
1510 !N!N!
1520 GOSUB 990
1530 !
1540 INPUT " IS THIS THE CORRECT RECORD (Y OR N) ? ",Z$
1550 FOR I=1 TO P1:NEXT
1560 IF Z$="Y" THEN 1580
1570 GOTO 1480
1580 FOR Q=1 TO T
1590 J=(Q-1)*15+1
1600 K=J+14
1610 S=S(Q)
1620 P=P(Q)
1630 !L$(J,K)," : ",E$(S,P)
1640 INPUT ".....CHANGE TO ? ",B$
1650 IF B$="" THEN 1670
1660 E$(S,P)=B$
1670 NEXT
1680 IF E$(D9,D9)=" " THEN 1710
1690 INPUT ".....RECORD IS DELETED. RE-INSTATE (Y OR N) ? ",Z$
1700 IF Z$="Y" THEN E$(D9,D9)=" "
1710 WRITE #2 %F*(R+2),E$,NOENDMARK
1720 GOTO 330
1730 REM ***** DISPLAY DEFINITION HEADER *****

```

More

base, L is incremented by 1 and rewritten by line 670. This ensures that the last record pointer in the database definition will be correct even if the program abnormally terminates.

A few words about access times. Each access to the database, either for a key search or a scan, requires a sequential read of the entire database. Needless to say, if the record you are searching for is close to the beginning of the database, it will be found sooner than if it is at the end. Search times will be faster for databases with shorter records. I therefore recommend that the data records be kept as short as possible. I have defined one database that has records that are 77 bytes long. To do a key search for record 50 takes about four seconds. Thus, if that database had 200 records in it, the maximum access time should not be greater than 16 seconds.

One other program is presented here. DBVERIFY is used to verify the database (see Listing 4). With it you can list the database definition from the definition file. It also verifies that the record number in the database definition's next record pointer is correct. If there is a difference, the program will notify you and correct the next record pointer. Sample 4 demonstrates the use of the DBVERIFY program.

Conclusion

To recap, follow these steps to define a new database: first, define the data record on paper, its length, the key and its location in the record, each field and its name and location. Then run DBDEFN. Simply answer its questions as per your definition. Next, run DBFRMT to format the database. Then run DBPROG. Select option 1 initially to load records into the database. Then select any of the other options to manage the data as desired.

I designed this database system to allow me to define various data files and access and maintain them with one supervisory program. The system sacrifices access time to allow duplicate keys and to eliminate the need for an ordered database. Even with its limitations, the program is excellent for cataloging many kinds of data, such as parts lists, recipe lists, personal checks, name and address lists, record album catalogs and household inventories. I've found that its capabilities far outweigh its limitations. ■


```

1740 !N!
1750 !TAB(10), "NAME OF DATABASE - ".X#
1760 !TAB(10), "NO. OF REC. IN FILE - ".L
1770 !TAB(10), "RECORD LENGTH - ".R
1780 !TAB(10), "KEY START POSITION - ".K0
1790 !TAB(10), "KEY STOP POSITION - ".K9
1800 !TAB(10), "POS. OF DEL. FLAG - ".D9
1810 FOR I=1 TO T
1820 IF S(I)=K0 THEN 1860
1830 NEXT
1840 !
1850 GOTO 1880
1860 I=(I-1)+15+1
1870 !N! RECORD KEY IS : ".L$(I-1)+14)
1880 !N!
1890 INPUT " ".Z$
1900 GOTO 350
1910 REM ***** RETRIEVE A RECORD BY RECORD NUMBER
1920 FOR I=1 TO P1:NEXT
1930 INPUT " ENTER RECORD NUMBER ? ".P
1940 IF F<0 OR F>L-1 THEN 1920
1950 !N!
1960 READ #2 %F*(R+2),E$
1970 GOSUB 970
1980 GOTO 330
1990 END

```

***** VERIFY DATABASE *****

ENTER NAME OF DATABASE ? PRS

DO YOU WANT A HARDCOPY (Y OR N) ? Y

DATABASE NAME	-	PRS
NO. OF REC. IN FILE	-	12
RECORD LENGTH	-	28
KEY START POSITION	-	1
KEY STOP POSITION	-	10
POS. OF DEL. FLAG	-	28

LABEL	START	STOP
PART NUMBER	: 1	10
DESCRIPTION	: 11	25
QTY ON HAND	: 26	27

***** END OF DATABASE VERIFY *****

Sample run 4. DBVERIFY is used to verify the database. It lists the database definition and verifies that the next record pointer is correct.



TONE SIGNALING Generators For Any Rotary Phone

Soft-Touch
\$39.95

Porta-Touch
\$59.95

Add \$1.00 for shipping. Tex. Res. add 5% Sales Tax.

Replaces mouth piece on most phones for direct connection with Soft-Touch tone. FCC Approved.

For use with GTE where Soft-Touch will not fit. Held over mouthpiece to amplify signal tones. 9 volt battery powered.

• Phone Banking • Mobile Radio • Central Dictation • Paging • Check Verification • WATS extender • Order Entry • Call Diverters • SPC Sprint, MCI Execunet, ITT City-Call •

Micro Products, Unlimited

P.O. Box 120005 Arlington, Tex. 76012
817/277-4198 ✓ 338

OHIO SCIENTIFIC USERS!

Read....

PEEK (65)

The Unofficial Users Journal

- ☐ Software Exchange
- ☐ Hardware Mods
- ☐ Peeks & Pokes
- ☐ Bugs & Fixes

Send \$12 for 12 issues to:

PEEK(65) ✓ 98
P.O. Box 347
Owings Mills, MD 21117

Maryland Subscribers add 5% sales tax
Foreign Subscribers add \$8 postage
Check reader preference card for free issue

```

10 REM ***** VERIFY DATABASE *****
20 REM
30 REM CODED BY JOHN E. BAILEY
40 REM SULPHUR, LA APRIL, 1980
50 REM
60 REM ***** PROGRAM NAME IS "DBVERIFY" *****
70 REM
80 DIM A$(15)
90 P1=11
100 FOR I=1 TO P1:NEXT
110 !N! ***** VERIFY DATABASE *****
120 !
130 INPUT " ENTER NAME OF DATABASE ? ".N$
140 IF LEN(N$)<>4 THEN 120
150 F$=N$+"DEFN.2"
160 OPEN #1,F$
170 !N!INPUT " DO YOU WANT A HARDCOPY (Y OR N) ? ".Z$
180 IF Z$="Y" THEN H=1 ELSE H=0
190 FOR I=1 TO P1:NEXT
200 READ #1,L,X$,R,K0,K9,D9
210 !#H," DATABASE NAME - ".X$
220 !#H," NO. OF REC. IN FILE - ".L
230 !#H," RECORD LENGTH - ".R
240 !#H," KEY START POSITION - ".K0
250 !#H," KEY STOP POSITION - ".K9
260 !#H," POS. OF DEL. FLAG - ".D9
270 !#H
280 !#H," LABEL START STOP"
290 IF TYP(1)=0 THEN 340
300 READ #1,A$,S,P
310 !#H," ".A$,": ".%4I,S," ".P
320 IF S=K0 THEN !#H" - KEY" ELSE !#H""
330 GOTO 290
340 IF H=0 THEN INPUT " ".Z$
350 D$=N$+"DATA.2"
360 DIM E$(R)
370 OPEN #2,D$
380 I=0
390 READ #2,E$
400 IF E$(K0,K9)=" " THEN 430
410 I=I+1
420 GOTO 390
430 IF I<0 THEN I=0
440 IF I=L THEN 540
450 !#H\!#H
460 !#H," ***** RECORD COUNTS DO NOT MATCH *****"
470 !#H
480 !#H," NO. OF RECORDS IN DEFN = ".L
490 !#H," NO. OF RECORDS IN DATA = ".I
500 !N!INPUT " TYPE STOP TO AVOID CORRECTING DBDEFN ? ".Z$
510 IF Z$="STOP" THEN 540
520 WRITE #1 %0,I,NOENDMARK
530 !#H\!#H".....DATABASE DEFN UPDATED."
540 !#H\!#H
550 !#H," ***** END OF DATABASE VERIFY *****"
560 CLOSE #1
570 CLOSE #2
580 !#H\!#H
590 END

```

Listing 4. Database verification program DBVERIFY.

Save
With

"Simply the Best"

Service Technologies

✧ Add lower case to any Centronics Printer! **\$89.00**

✧ Add Motor Control to your 779! **\$95.00**

Our Conversion Kit I gives all Centronics printers the ability to print upper and lower case price \$89.00.
* Optional customer defined character sets available
Our Conversion Kit II turns your motor on and off automatically, increases the life of your printer: \$95.00.
Both kits require NO soldering, etchcuts, software change, interface or program modifications. Installs in minutes with just a screw driver

We are the original Centronics add-on company.
Don't be fooled by imitations!

NOW USE YOUR CENTRONICS PARALLEL PRINTER ON ANY COMPUTER WITH A SERIAL PORT!

AVAILABLE IN FOUR MODELS, ALL WITH SWITCHABLE BAUD RATES

✧ **CSP - 100**
NO BUFFER\$175.00
CSP - 200
256 CHARACTER BUFFER\$225.00
CSP - 200X
X ON/OFF PROTOCOL\$340.00
CSP - 2000
2048 CHARACTER BUFFER\$395.00



And more.....

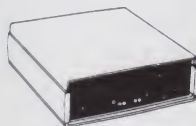
✧ **C-488 IEEE PARALLEL "LISTEN ONLY" TO CENTRONICS INTERFACE**

- Input IEEE 488 GPIB, Hewlett Packard HPIB, or PET compatible
- Switchable device address
- Disable switch for address and parallel commands \$125.00

✧ **PSI PARALLEL SWITCH ALLOWING TWO DEVICES TO SHARE ONE LINE PRINTER**

- Two parallel input ports - one parallel output port
- Manual or remote switching control \$125.00

✧ **SDP-1**
A USER PROGRAMMABLE SERIAL DATA PROCESSOR WITH THE CAPABILITY OF COMBINING MULTIPLE SERIAL DATA OPERATIONS



- Z-80 Microprocessor - controlled
- Buffer allocation, synchronous or asynchronous operation including transparent or non transparent mode.
- Code, word structure and baud rate conversions Ex. ASCII to EBCID or ASCII to BAUDOT
- Handles baud rates of 50-19,200 b.p.s
- Buffer size expandable from 4K - 64K RAM memory
- Audio cassette interface
- Independent and separately controlled input and output ports.

OUR QUALITY, SERVICE, WARRENTY AND PRICE CAN'T BE BEAT

To order please send check or money order to;



Service Technologies ✓208
32 Nightingale Rd.
Nashua, N.H. 03062
(603) 883-5369



Visa and Master Card accepted (include signature expiration date and phone #)

phone orders and inquiries always welcome

CALL US YOUR ORDER TOLL FREE!

International Business Forms, Inc.

SINCE 1970

"PRODUCTS FOR YOUR COMPUTER OR BUSINESS"

- ☆ Swingline Bursters & Decollators
- ☆ Custom & Stock Continuous Forms
- ☆ Continuous Mailers
- ☆ Floppy Diskettes, Ribbons
- ☆ Snap-Apart Forms
- ☆ Register Forms
- ☆ Pegboard Systems
- ☆ Word Processing Forms
- ☆ Roll Papers/Thermal Papers
- ☆ Continuous Labels
- ☆ Stock Continuous Checks, Invoices Statements
- ☆ Envelopes, Letterhead, & Business Cards

THOUSANDS OF DIFFERENT ITEMS - ASK US

ON REQUESTS FOR CATALOGS & PRICES - BE SPECIFIC ABOUT YOUR NEEDS

PRODUCT #	DESCRIPTION	QTY. PER CARTON	*COST/CARTON
9511-15-1m	9 1/2x11" 1 part-15# Stock Tab	1500	21.38
9511-20-1m	9 1/2x11" 1 part-20# Stock Tab	1250	20.81
9511-cc-2m	9 1/2x11" 2 part-Carbonless	750	30.70
9511-cc-3m	9 1/2x11" 3 part-Carbonless	500	31.91
1411-15-1m	14 7/8x11" 1 part-15# Stock	1500	29.50
1411-cc-2m	14 7/8x11" 2 part-Carbonless	750	42.55
1411-cc-3m	14 7/8x11" 3 part-Carbonless	500	45.40
1411-cc-4m	14 7/8x11" 4 part-Carbonless	375	46.32
1411-20-1	14 7/8x11" 1 part-20# Stock	2700	56.75
1285-18-1	12x8 1/2" 1 part-18# Stock (Form is 11"x8 1/2" - Torn Apart)	2900	48.28
33-1L	1 5/8x3 1/2" 1-up Stock Labels	5000	20.00
33-2L	1 5/8x3 1/2" 2-up Stock Labels	10000	35.00
33-3L	1 5/8x3 1/2" 3-up Stock Labels	15000	48.00
UOS-2L**	1 5/8x4" 2-up Stock Label	5000	37.50
(**SPECIAL CARRIER 9 1/2"x9" C.C. for fixed-platen printers)			
63-1TC	Cont. White 3x5 cards 1-wide	4000	40.00
63-2TC	Cont. White 3x5 cards 2-wide	8000	76.00

1/2" GREEN BAR

ORDER FORM: (fill out & call order toll-free or mail to address below)

PRODUCT #	DESCRIPTION	QUANTITY	COST/UNIT	TOTAL AMOUNT
*PRICES INCLUDE DELIVERY IN 48 CONTIGUOUS UNITED STATES			TOTAL	

*Prices subject to change without notice

NAME _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

You can charge your orders to your VISA or Master Charge



MC ☐



VISA ☐

Money Order, Certified Check, or Personal Check. (On personal checks - goods shipped after check clears.) ☐

Account No. _____

Expiration Date _____

Issuing Bank No. _____

Signed _____

Mail Address
for Custom
Forms, Tech-
nical Questions,
& Mail Orders

International Business Forms, Inc.
NATIONAL MAIL ORDER DEPT. JMS
E. 15205 14th
Veradale (Spokane), WA 99037 ✓127

PHONE FOR TECHNICAL ASSISTANCE & CUSTOM PRICE QUOTES:
(509) 922-4428 • 8 am - 5 pm (PST) • Mon. - Fri.

1

*Price Breaks on Larger Quantities

TO PHONE-IN ORDER OR **NATIONWIDE 1-800-547-5995 Ext. 135**
REQUEST CATALOG CALL: **In OREGON 1-800-452-8847 Ext. 135**

Thoughts on the 68XX System

By Peter A. Stark

The suggestion has been made that I rename this series, as it really covers much more than just the SWTP computer system. Thus the new name, which more adequately describes the fact that most of the material in these columns applies not just to SWTP mainframes, but to 6800, 6802 and 6809 systems made by others as well.

Real-Time Clock

January's installment described a status line on a video board display, and mentioned several uses for such a line. Let's follow that up a bit more.

There are various status line displays which do not require a real-time clock—for instance, a disk operating system could be easily patched to display the drive, track and sector numbers in a particular spot on the video screen each time it reads or writes a sector.

On the other hand, a real-time clock simplifies the display of other status information. For that reason we should examine what it is.

There is a difference between a clock and a real-time clock. A clock shows the actual time; a real-time clock only indicates passing time. A real-time clock can be compared with a metronome—it ticks like a clock, but it doesn't have a display to show the current time. However, we can figure out how much time has passed from any beginning point by counting how many ticks we have heard.

An actual clock board is quite a bit more complicated than a real-time clock. Several clock boards are available (one is the Microtime board available from several dealers; others are available from JPC Products, PO Box 5615, Albuquerque, NM 87185, and Robertson Electronics, 1003 Warm Sands Drive, SE, Albuquerque, NM 87123). A calendar clock circuit for the 6800 was described in the June 1980 *Kilobaud Microcomputing* (p. 188).

Each of these circuits uses a series of counters like those in a digital watch, which count up by one each second and provide a constant read-out of the current time. In order to avoid losing time when the power is off, most such circuits allow a battery to power the counters so they can continue to run when the rest of the computer is shut down. Once such a clock is set, it continues to indicate the actual time in hours, minutes and seconds (and sometimes the date as well).

A real-time clock, on the other hand, does not indicate the time directly. Instead, it provides ticks which can be used to compute the time if desired (assuming that the time between ticks is precisely known and controlled).

These ticks generally cause IRQ interrupts, which cause the 6800 to temporarily suspend normal programming and jump to an interrupt service subroutine (ISS).

When such an interrupt arrives, it can be used to compute current time, display some system variables or switch between tasks in a multiprogramming system (which is a concept we discussed in the October 1980 installment).

A real-time clock is more than just an oscillator which pulses the IRQ line. It does do that, of course, but it also has circuitry which can turn the clock on and off, so that it does not start to generate clock pulses until the system has an ISS in place and ready. Moreover, since the 6800 might interrupt more than once if the clock pulse were wide enough, the clock board must have circuitry which provides a pulse long enough to be detected even if the 6800 is busy with another job and has its interrupt system temporarily disabled, but turns off the IRQ pulse as soon as the 6800 is actually interrupted. Thus, a real-time clock usually consists of several ICs.

SWTP makes a real-time clock called an MP-T timer, which is programmable and can cause interrupts (ticks) to occur at a wide range of precisely controlled intervals. However, if you want to experiment with a real-time clock, but don't need such precise timing, you can use a spare MP-S serial interface board. (Make sure that it has an IRQ jumper installed.)

When a character is sent to the ACIA in the MP-S by the 6800 proces-

Peter A. Stark, PO Box 209, Mt. Kisco, NY 10549.

sor, the ACIA sends it out in serial—one bit at a time—at the baud rate selected by the jumpers on the board. When it has finished sending the character, it turns on the TDRE (transmitter data register empty) bit in its status register. This is how software generally knows when it is time to send the next character. If the MP-S is set to 300 baud, for example, then the TDRE bit will come on 1/30 second after the ACIA receives a character from the 6800.

If, however, the ACIA is properly initialized, it can also generate an interrupt at the same time that TDRE goes on. Consequently, we can use an ACIA to generate a fixed time delay, and then cause an interrupt. If we restart the ACIA as soon as we receive that interrupt, then it will start all over again. Thus, it can provide a constant series of ticks. It need not actually have any I/O device connected to it to do this; in fact, it's better if it is an extra MP-S board in some otherwise unused slot.

Depending on how the ACIA is initialized, we do have some control over the time interval between ticks. This time depends on the baud rate, the number of bits in each character, and the clock divisor used by the ACIA. We'll leave the fine points to you, and consider just a simple case.

Let's assume that we have an MP-S card in port 0; the ACIA uses address 8000 for its control and status register, and address 8001 for data. To initialize the ACIA to turn its interrupts on, we place \$35 into the control register (location 8000); to turn interrupts off, we replace it with \$15.

If we turn on the ACIA's interrupt system and then start the ACIA by placing a data character into its data register, location 8001, it will output that character in serial. When it is finished, it turns on the TDRE bit in the status register (location 8000), sends out a low pulse on the IRQ line to the 6800 and turns on the IRQ bit, bit 7, in the status register (location 8000). A program can test this bit to check whether the interrupt came from the ACIA or somewhere else.

Listing 1 shows an actual program which makes use of this idea. The program consists of two parts—an initialization routine which starts the ACIA going, and an ISS which is called at each tick, and which (among other things) restarts the ACIA.

At location B000, the program resets the ACIA by storing 03 into it; the ACIA does not have a reset pin and so

must get reset by software when first starting up the system.

At location B005, the program stores the address of ISS into address A000, which is the monitor's IRQ vector. This means that when an IRQ occurs, the monitor will steer the computer to execute the ISS program, and thus start the interrupt service subroutine.

After some more initializing (more on that later), at location B01E we store a \$35 into the ACIA's control register to enable its interrupts. This is followed by sending out character \$FF to be printed. Although any character could have been chosen, the \$FF is a rubout which will not be printed even if you have a printer connected to the ACIA. (However, a word of caution—although the ACIA can have an I/O device connected to it, that device must not be used while we are using the MP-S port for a real-time clock!)

Finally, a CLI instruction enables

the interrupt system in the 6800 (it is preceded by a NOP, since some earlier 6800 ICs did not work properly unless CLI and SEI instructions were preceded by NOPs).

At this point, we assume that the initialize routine returns to whatever program called it, and this program continues.

When the ACIA has finished outputting, however, it generates an interrupt. As a result, the above program is interrupted, and the computer comes to the interrupt service subroutine at the entry point ISS.

Since interrupts can come from several places in the computer, we begin by testing whether it in fact came from where we think it came from. This is done at location B02B, where we load the status bits from the ACIA, move the leftmost bit (the IRQ bit, bit 7) into the carry bit and continue to OK if the carry is set.

If the carry is not set, the interrupt came from elsewhere. In that case,

Listing 1. MSCAN program.

```

NAM    MSCAN

* THIS PROGRAM PRODUCES A MEMORY USAGE MAP
* IN THE VIDEO STATUS LINE

* EXTERNAL REFERENCES
A000)  IRQ    EQU    $A000    IRQ VECTOR
8000)  ACIA   EQU    $8000    PORT 0 ACIA
E07E)  PDATA  EQU    $E07E    PRINT STRING ROUTINE
E0E3)  MONITR EQU    $E0E3    MONITOR RETURN POINT
D800)  SCRAM  EQU    $D800    SCREEN RAM START
D010)  TOP    EQU    $D010    USABLE RAM TOP ADDRESS

* INITIALIZE AND START DISPLAY ROUTINE

B000)          ORG    $B000
8000 86 03     INITLZ LDA A #$03
8002 B7 8000   STA A ACIA      RESET ACIA BEFORE STARTING
8005 CE B02B   LDX  #ISS
8008 FF A000   STX  IRQ        INITIALIZE INTERRUPT POINTER
800B CE D800   LDX  #SCRAM     POINT TO START OF SCREEN RAM
800E FF B073   STX  PREV      INIT PREVIOUS POINTER
B011 86 20     LDA A #$20      GET A SPACE
B013 A7 00     ERASE STA A 0,x  ERASE NEXT BYTE
B015 08        INX
B016 8C D850   CPX  #$D850     END OF LINE?
B019 26 F8     BNE  ERASE      NO
B01B FF D010   STX  TOP        YES; RESERVE A LINE
B01E 86 35     LDA A #$35      INIT ACIA CR TO 00110101
B020 B7 8000   STA A ACIA
B023 86 FF     LDA A #$FF
B025 B7 B001   STA A ACIA+1    START ACIA ACTION
B028 01        NOP
B029 0E        CLI            ENABLE INTERRUPTS
B02A 39        RTS

* INTERRUPT SERVICE SUBROUTINE

B02B B6 8000   ISS  LDA A ACIA  TEST FOR INTERRUPT
B02E 48        ASL  A
B02F 25 19     BCS  OK         IF CAUSED BY TIMER

```

More →

Listing 1 continued.

```

B031 86 15          LDA A #15          TURN OFF ACIA INTERRUPT
B033 B7 8000        STA A ACIA
B036 CE B03F        LDX #ERRMSG        OTHERWISE PRINT ERROR MESSAGE
B039 BD E07E        JSR PDATA
B03C 7E E0E3        JMP MONITR
B03F 41             ERRMSG FCC 'ACIA ERROR'
B049 04             FCB 4

B04A 30             OK      TSX          TRANSFER STACK PTR TO INDEX
B04B E6 05          LDA B 5,X          GET PC HI
B04D 54             LSR B
B04E 54             LSR B          MOVE MSB TO RIGHT
B04F 54             LSR B
B050 54             LSR B
B051 F1 B074        CMP B PREV+1
B054 27 17          BEQ SAME          SKIP IF SAME AS PREV
B056 FE B073        LDX PREV          POINT TO PREV DIGIT
B059 86 20          LDA A #20
B05B A7 00          STA A 0,X          ERASE IT
B05D F7 B074        STA B PREV+1      POINT TO NEW LOCATION
B060 CB 30          ADD B #30          CHANGE DIGIT TO ASCII
B062 C1 3A          CMP B #3A          IS IT 0-9?
B064 25 02          BCS NUMBER        YES
B066 CB 07          ADD B #07          NO, CHANGE TO A-F
B068 FE B073        LDX PREV          POINT TO NEW LOCATION
B06B E7 00          STA B 0,X          MODIFY IT
B06D 86 FF          LDA A #FF          RESTART ACIA
B06F B7 8001        STA A ACIA+1
B072 3B             RTI              AND RETURN

B073             PREV RMP 2          POINTER TO PREVIOUS LOCATION

END

```

ner of the screen which indicates what addresses are currently being used by the running program. When a program which is located in the range of 1000-1FFF is running, for example, the screen shows the display

.1.....

(except that the screen has blank spaces rather than periods). If a program located up in the 6000 area is running, then the display is

.....6.....

If the programs were rapidly jumping back and forth to each other, then the display would be

.1....6.....

with the 1 and 6 flashing alternately. By observing this kind of display, we can get an idea whether programs are running correctly.

In this particular version, we assume that the screen RAM starts at location D800 (which is called SCRAM in the program) and that the top line is reserved for status. Locations D800-D84F are used for status, and the regular display starts at D850. The video driver we described in January requires that location D010 be set to D850 to achieve this.

With this as a background, let's see how the program works.

During initialization, the SCRAM address of D800 is placed into location PREV, which is used to indicate the previous digit displayed in the map.

The next part of the program, at location B011-B019, erases the 80-byte top line of the display, and then the number D850 is placed into TOP to tell the video driver not to use the top line. All of this is, of course, sandwiched between the ACIA initialization we discussed earlier.

Each time an interrupt occurs, the computer goes to the ISS routine. After some preliminaries, it reaches OK at location B04A, where the TSX instruction moves the contents of the stack pointer (plus 1) into the index register. Five bytes up is the first half of the program counter, which tells us the address of the instruction which would have been performed next had there been no interrupt. This is loaded into the B register.

A series of LSR (logical shift right) instructions moves the leftmost hex

we turn off the ACIA interrupt system by putting 15 into it (at location B031), print an error message and jump to the monitor.

If the interrupt really came from our real-time clock, then we continue at OK. After some more processing, we restart the ACIA by sending another \$FF to it in location B06D, and execute an RTI, or return from interrupt. This returns to the main program, which will execute until the next interrupt tick comes. In this case, we get about 30 interrupts per second if the ACIA is set for 300 baud.

This explains how we can use an extra MP-S interface's ACIA as a simple real-time clock. Now what can we do with it?

Program MSCAN

January's article showed how to reserve an extra status line on a Percom video board display. The same idea can be applied to any of the many other video boards available. Listing 1, called MSCAN, is a program which makes use of this to produce a memory usage map as other programs are running.

This is a display in the top left cor-

ADD lowercase with our PLUG-IN piggyback board!

CENTRONICS

NOW! Add lowercase and optional second character sets to **ALL MODELS*** Centronics printers — including the popular 101A and 779: 96 Character ASCII; Optional character sets: APL, TRS-80/H-19 Graphics, Scientific, Customer-defined.

*Except 730, 737 and 6000-series

Available now in two versions:

5W x 7H (all models*) — \$95.00
5 x 7 optional sets — add \$15.00 each

9W x 7H (101/101A/779) — \$135.00
INTRO SPECIAL — FREE optional set on
9 x 7 order placed before 3/31/81

ALSO: Refurbished Printers!

Limited quantity now in stock:

730-1: \$450 306: \$595
101/101A: \$795 103: \$995
102: \$1195 Shipped postage collect

DSE Digital Systems Engineering

12503 King's Lake Drive
Reston, Virginia 22091
(703) 620-2994

All products warranted 90 days
MasterCard, VISA, Check, MO, PO

WE WILL NOT BE UNDERSOLD



DISK DRIVES

\$314

40 track, 102K Bytes. Includes power supply and TRS-80* compatible silver enclosure. Ready to plug-in and run the moment you receive it. Can be intermixed with each other and Radio Shack drive on same cable. 90 day warranty. One year on power supply. Available for 220 Vac (50 Hz) operation. **External card edge included.**

FOR TRS-80*

CCI-100 TEAC	5 1/4", 40 Track (102K Bytes) for Model I	\$314
CCI-100 MPI	5 1/4", 40 Track (102K Bytes) for Model I	\$319
CCI-280	5 1/4", 80 Track (204K Bytes) for Model I	\$429
For Zenith Z89		
CCI-189	5 1/4", 40 Track (102K Bytes) add-on drive	\$394
Z-87	Dual 5 1/4" add-on drive system	\$995

NEW • S-100 CCS CARDS

MAINFRAME, Z-80 CPU, CONTROLLER, RAM, and 2P + 2S CARDS

\$CALL

8" SHUGART SA801R DISK DRIVES

\$425

DISK OPERATING SYSTEMS

PATCHPAK #4 by Percom Data	\$ 8.95
CP/M® for Model I, Zenith	\$145
NEWDOS Plus 40track	\$79
for Model II, Altos	\$169
NEWDOS 80	\$135

DISKETTES

— Box of 10 with plastic library case			
5 1/4"	Scotch \$35	Maxell \$40	BASF/Verbatim \$24
8"	Scotch \$50	Maxell \$55	BASF/Verbatim \$36
CLEAR PLASTIC CASE-Holds 50 5 1/4" diskettes			\$19

COMPLETE SYSTEMS

ALTOS ACS8000 Computers	\$CALL
APPLE II-16K \$1075	•
Call for other Apple products	
TRS-80* Model II-64K \$3499	•
Used TRS-80* Model I Computers, tested and guaranteed	\$CALL
ZENITH Z89, 48K all-in-one computer	\$2395
ZENITH Z19	\$735
TELEVIDEO 920C	\$748
ATARI 400 \$479	ATARI 800 \$769
APF Game Only \$95	Complete System \$489
MATTEL INTELLIVISION	\$229

MONITORS

LEEDEX 12" B & W Video 100	\$129
ZENITH 13" Color	\$379
SANYO 9" B & W VM4509	\$155
SANYO 12" B & W DM5012	\$226
SANYO 12" Green Screen DM5112	\$238
SANYO 13" Color DMC6013	\$416
APF 9" B & W TVM-10	\$120

TELECOMMUNICATIONS

LIVERMORE STAR MODEM 2-year guarantee	\$145
UNIVERSAL DATA SYSTEMS UDS-103	\$179
D-CAT HARD WIRED DIRECT MODEM	\$189
AUTO-CAT Auto Answer, Direct Connect Modem	\$229

PRINTERS



NEC Spinwriter

Letter Quality High Speed Printer

Includes TRS-80* interface software, quick change print fonts, 55 cps, bidirectional, high resolution plotting, graphing, proportional spacing: R.O. **\$2395**

R.O. with Tractor Feed **\$2595** KSR with Tractor Feed **\$2895**

C.I.TOH Starwriter, 25 CPS, daisy wheel printer **\$1795**

C.I.TOH Starwriter II, 45 CPS, daisy wheel printer **\$1995**

Letter quality printers. Use up to 15" paper. 1 year warranty on parts. 3 months on labor. Proportional spacing and bidirectional printing. Same as VISTA V300.

EPSON MX-80 **\$CALL**

PAPER TIGER IDS 445 Graphics and 2K buffer **\$699**

IDS 460 Bidirectional, 160 cps, graphics and 2K buffer **\$1050**

IDS 560 132 Columns, graphics **\$1599**

ANADEx DP-9500/01 **\$1345** DP-8000 **\$849**

OKIDATA Microline 80 Friction and pin feed **\$499**

Tractor Feed, friction, and pin feed **\$625**

Microline 82 Bidirectional, friction and pin feed **\$719**

Microline 83 Bidirectional, 120 cps, uses up to 15" paper **\$995**

CENTRONICS

737 Friction & pin feed **\$780**

730 Friction & pin feed **\$595**

779 Tractor feed **\$969**

EATON LRC 7000 + 64 columns, plain paper **\$269**

TI-810 Includes TRS-80* software and

Compressed print, vertical form control **\$1865**

16K RAM KITS

2 for \$56

\$30

200 ns for TRS-80*, Apple II, (specify): Jumpers

\$2.50

ACCESSORIES

Z-80 SOFTCARD: Your key to software expansion. The plug-in Z-80 Softcard transforms your Apple into a Z-80 while keeping all the benefits of the 6502. Comes with CP/M in two disk format, MBASIC and GBASIC, full documentation and utility programs. **\$339.00**

SCOTCH HEAD CLEANING DISKETTE: Cleans drive Read/Write head in 30 seconds; specify 5 1/4" or 8". **\$25.00**

FLOPPY SAVER: Protection for center holes of 5 1/4" floppy disks. Installation tools and rings for 25 diskettes. **\$ 11.95**

Re-orders of rings only **\$ 6.95**

VIDEX BOARD 80 Column, U/L case conversion card **\$279.00**

CRT FILM: Helps eliminate external glare, 9" **\$ 29.00**

RF MODULATOR: Adapts video to TV **\$ 29.00**

TRS-80 & OTHER MYSTERIES **\$ 18.95**

NEC SPINWRITER THIMBLE **\$11.95** RIBBON **\$ 6.00**

CCS CARDS: Parallel or serial printer interface cards **\$115.00**

RS232: For Radio Shack Interface. **\$ 84.00**

DISK-DRIVE EXTENDER CABLES: Fits all mini-disk drives. **\$ 16.95**

SIX (6) PRONG ISOLATOR: ISO-2 **\$ 54.00**

AC FILTER/6 PRONG POWER STRIP **\$ 39.00**

DISK DRIVE CABLES: 2 drive **\$29.00** 4 drive **\$ 35.00**

DUST COVERS: TRS-80/Apple **\$ 7.95**

PLASTIC DISKETTE HOLDER: For ring binder, holds 20 **\$ 8.00**

COMMUNICATIONS SOFTWARE

CCI-TELNET COMMUNICATIONS PACKAGE:

Communications with mainframes and micros. CP/M compatible **\$149.00**

For fast delivery, send certified checks, money orders or call to arrange direct bank wire transfers. Personal or company checks require two to three weeks to clear. All prices are mail order only and are subject to change without notice.

DEALER (NATIONAL/INTERNATIONAL) INQUIRIES INVITED

Send for **FREE Catalogue**

The CPU SHOP

TO ORDER CALL TOLL FREE 1-800-343-6522

TWX: 710-348-1796 Massachusetts Residents call 617/242-3361

5 Dexter Row, Dept. K03M
Charlestown, Massachusetts 02129
Hours 10AM-6PM (EST) Mon.-Fri. (Sat. till 5)

Technical Information call 617/242-3361
Massachusetts Residents add 5% Sales Tax
Tandy Corporation Trademark/ Digital Research



digit to the right, and it is now compared with the right byte of PREV. Because the screen memory starts at an even boundary of D800, if the PC started with 0 we want to display 0 at location D800, and so on, up to F at location D80F if the PC started with F.

Since PREV points to the previous digit's location, we can look at its rightmost byte to determine what digit is currently being displayed. If it is still the same, the program simply goes to SAME, resets the ACIA and exits. By not updating the screen when the display is not changing, we avoid unnecessary flicker.

If the new PC address starts with a different digit from the previous one, then we update the display. First, at B056 we point the index register to the location of the previous digit and then replace it with a space to erase it. Then we change PREV by storing the leftmost digit of the PC (which has been in the B accumulator all this time) into its second byte. The next few instructions convert this digit into ASCII. Finally, at location B068, we point the index register to the new location (which is now in PREV) and

store the new ASCII character in that spot. Then we restart the ACIA and return from the interrupt to the main program.

Variations on this program can be used to display other useful facts in the status line of the display; just add the additional steps where SAME is.

Even if keeping a status line is of no interest to you, if you have a video board then this is a simple program which can give you a little experience using interrupts.

Programming the 2732 EPROM

The 2732 4K×8 EPROM (which is not the same as TI's TMS-2532) is sufficiently similar to the 2716 that it can be programmed with the SWTP MP-R programmer. Only three wiring changes and some program changes are required. (I covered 2708 programming on p. 82 of the February 1980 issue of *Kilobaud Microcomputing*.)

The 2732 pin functions differ from the 2716 in several ways. First, pin 21 (which is called Vpp on the 2716 and gets +25 V during programming) now gets A11, an additional address bit. To implement this change, cut

the copper trace which goes from diode D1 to pin 21 of the EPROM socket and also cut the trace connecting R7 to pin 12 of IC3. Then connect EPROM pin 21 to IC3, pin 12, and connect the cut lead of R7 to IC3, pin 9. (This changes the control bit for the +5 V supply, but that is taken care of by software.)

Next, pin 20 of a 2716 is an active low chip select, whereas pin 20 of a 2732 is a combination \overline{OE}/V_{pp} pin which is to be low normally, but at +25 V during programming. To implement this change cut the trace connecting pin 20 of the EPROM socket to IC3, pin 5, and connect pin 20 instead to the anode side of diode D2.

Next, make sure that a 0.1 μ F disk capacitor has been installed in parallel with R6, as instructed in an addendum to the SWTP instruction sheets.

One more caution is in order. The Intel 2732 EPROM requires +25 V for Vpp, which is supplied by the MP-R board. However, the Intel 2732A EPROM (note the A after the 2732!) requires only 21 V and can be damaged if more than 21.5 V is applied. If you are using the 2732A, you

TOLL FREE ORDERING



These Fine Products and More

NORTHSTAR
HRZ 1-32K-D \$1990
HRZ 2-32K-D 2295
HRZ 2-32K-Q 2690
HARD DISC SYSTEM 3935

DYNABYTE
DB 8/1 48K \$2395
DB 8/2 48K 3900
DB 8/4 3030
32M PHOENIX 11800

TERMINALS
TELEVIDEO 912C 698
TELEVIDEO 920C 748
SOROC IQ-120 695

PRINTERS
NEC 5510 (w TRACTORS) 2575
NEC 5520 (w TRACTORS) 2900
TI-820 1640
TI-810 1495
ANADIX DP-9500 1345
CENTRONICS 737 850
EPSON TX80 CALL

MORROW
DISCUS 2D 2 DRIVE 1550
DISCUS 2 + 2 1 DRIVE 1265
DISCUS M26 HARD DISC 3990

SOLID STATE MUSIC KIT Asm
CB2 Z80CPU 200 265
VB1C VIDEO 140 190
SB1 SYNTHESIZER 195 270

MEASUREMENT SYSTEMS
MEMORY
DM3200 32K 4MHz 480
DM6400 64K 4MHz 595
DMB6400 64K 4MHz
BNK SEL 745

SOFTWARE-DISCS
NORTHSTAR SOFTWARE .CALL
WORDSTAR 350
DATASTAR 250
MAGIC WAND 290
GRAHAM-DORIAN
STRUCTURED SYSTEMS .CALL
5" DISCS 27
8" DISCS 35

WE WILL TRY TO BEAT ANY ADVERTISED PRICE
Automated Equipment Inc.
18430 Ward
Fountain Valley, CA 92708
(714) 963-1414 (800) 854-7635

Computers Terminals Modems

We are the stocking terminal distributor offering full service, on-site maintenance coverage.

CRT's

Perkin-Elmer Bantam 550B	\$749	Perkin-Elmer Super Owl 1250	\$1799
Microterm Act VA	779	Microterm Mime IIA	819
IBM 3101 Model 10	1191	IBM 3101 Model 20	1375
Dec VT100	1699	Televideo 912C	799
Televideo 920C	839		

Hardcopy Terminals

DEC LA34AA	939	DEC LA34DA	1149
Teletype Model 43 KSR	1049	NEC Spinwriter 5520	3088
with RS232C and connector cable		Typewriter quality with Tractor, ribbon, thimble	

Printers

Perkin-Elmer 650/655 CRT	999	NEC Spinwriter 5510	2754
Screen Printer		Typewriter quality with Tractor, ribbon, thimble	
100 CPS			

Microline 80	594		
Centronics 737	828	Centronics 779	1068

call for other Centronics models

Modems

Bell 212A — Penril 300/1200	799	Bell 103/113 — USR-330	339
1200 and 300 Baud/Manual		300 Baud/Manual originate	
originate auto answer		auto answer	
Auto dial option	799	Auto dial option	50

(Both modems connect to phone lines via RJ11C standard extension phone jack.)

Acoustic Coupler

Phone Link — 300 Baud	179	USR-1600P	4099
-----------------------	-----	-----------	------

Originate and answer. Compact.

Computers

Leasing rates on request. Write or call for product information.
10 day money back guarantee on all products.



U.S. ROBOTICS INC.
203 N. WABASH
SUITE 1718
CHICAGO, ILL 60601
(312) 346-5650

must include some additional regulation—perhaps using a Zener diode—to limit Vpp.

Next, make the changes shown in Listing 2 to the SWTP program. These change the buffer size and the sequencing of the power to supplies and programming pulses.

Finally, save the modified program from 0020 through 07E1, with a starting address of 0100.

Video Boards as Terminals

One of the unexpected expenses in setting up an SS-50 bus system is the need for a terminal. This is one of the factors which often swing a newcomer in the direction of a Radio Shack or Apple system, since the price of an SS-50 system plus a terminal usually exceeds the price of an all-in-one system.

Needless to say, a serial terminal is not absolutely needed; a video board and parallel keyboard can do the job as well, and at much lower cost.

Making the video board and the keyboard work with standard programs requires two separate interfaces—one software, the other hardware.

0037	OFFF	CHANGE BUFFER END ADDRESS
0422	86 10	TURN ON ONLY +5 VOLTS
044D	86 10	TURN ON ONLY +5 VOLTS
0479	86 10	TURN ON ONLY +5 VOLTS
04A8	BD 07C0	JSR TO PATCH 1
04AB	01	
04C6	BD 07D0	JSR TO PATCH 2
04C9	01	
0561	86 90	+5V ON, +25V ON, CE' PULSED LOW
0573	86 B0	+5V ON, +25V ON, CE' BACK TO HI
0580	86 30	+5V ON, +25V OFF, CE' KEPT HI
* PATCH 1 - TURN ON +25 VOLTS BEFORE PROGRAMMING		
07C0	86 20	+5V ON, CE' HI
07C2	97 26	STORE IT
07C4	BD 05D6	JSR TO PIA PULSING ROUTINE
07C7	86 B0	+5V ON, +25V ON, CE' STILL HI
07C9	97 26	
07CB	BD 05D6	JSR TO PIA PULSING ROUTINE
07CE	39	AND RETURN
* PATCH 2 - TURN OFF 25 VOLTS AT END OF PROGRAMMING		
07D0	86 30	+5V ON, +25V OFF, CE' HI
07D2	97 26	
07D4	BD 05D6	JSR TO PIA PULSING ROUTINE
07D7	BD 04FE	WAIT 10 SECONDS
07DA	86 10	+5V ON, +25V OFF, CE' BACK TO LOW
07DC	97 26	
07DE	BD 05D6	JSR TO PIA PULSING ROUTINE
07E1	39	AND RETURN

Listing 2. SWTP programmer modifications.

For terminal output, standard 68xx software simply outputs via a serial board in port 1. Although older systems use a PIA (in a circuit which is a

AUTHORIZED TRS 80® DEALER #R491

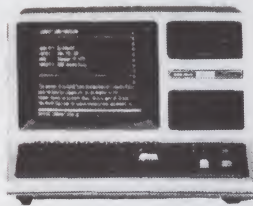


26 - 1056
16K Level II with

\$670.00

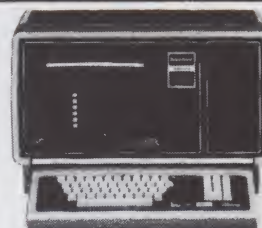
WE ACCEPT CHECK, MONEY ORDER, OR PHONE ORDERS WITH VISA OR MASTER CHARGE. SHIPPING COSTS WILL BE ADDED TO CHARGE ORDERS. DISK DRIVES, PRINTERS, PERIPHERALS, AND SOFTWARE - YOU NAME, WE'VE GOT IT. WRITE OR CALL FOR OUR COMPLETE PRICE LIST.

C & S ELECTRONICS, LTD. 32 EAST MAIN ST. MILAN, MICH. 48160
(313) 439-1508 (313) 439-1400



26 - 1062
Model III 16K RAM
Model III, BASIC

\$875.00



26 - 4002
Model II, 64K

\$3500.00

FULL FACTORY WARRANTY
ON ALL ITEMS SOLD.

C & S ELECTRONICS MART IS AN AUTHORIZED TRS 80® SALES CENTER STORE #R491

relic of MIKBUG days), the modern approach is to use an ACIA circuit such as that of the SWTP MP-S serial card. The terminal output routine—part of the ROM monitor and usually called OUTEEE—consists of three essential steps (two to check whether the ACIA is busy, and one to output the actual character) plus a few extra instructions which pick up the port address and configure the ACIA for proper output. The rest of the terminal functions—scrolling, moving the cursor, etc.—are taken care of by the terminal itself.

When using a video board, these ancillary functions must be taken care of by software. As described in January's article, scrolling is sometimes partially handled by video board hardware, and sometimes completely done by software. In either case, however, an extensive amount of software is needed to do the job.

When a separate terminal is used in addition to the video board, it is feasible to keep this software on tape or disk and load it into the computer's RAM each time the computer is turned on. But when no terminal is present, then the video board software must be located in ROM; moreover, it must be linked to the monitor program so that it is automatically brought up as power is turned on. In other words, a special monitor program must be used with the video board in that case.

Fortunately, a monitor does exist for every current video board being made—Gimix has GMXBUG, Thomas has JOEBUG, and Percom's video board is supported by my HUMBUG monitor (described in the August 1980 installment and available from Star-Kits). Using a video board, then, simply involves getting the appropriate monitor ROM to handle it.

Parallel keyboard input, on the other hand, is not so easy. The standard procedure is to connect the keyboard through a parallel interface, such as the SWTP MP-LA card. The seven-bit data from the keyboard goes into the *data port*, while the data strobe bit goes into one of the PIA handshaking lines on the port. Since the PIA is intended for just such parallel inputs, this is a good hardware match. (On disk systems this PIA interface would be used instead of an ACIA interface; on tape systems both may be required—one for the keyboard and the other for the tape interface.)

But there is usually some software

required as well. Since the routine needed to initialize and input from a PIA differs from that needed for an ACIA, the INCH or INEEE routine must also be different.

As before, if a serial terminal is available, then this revised routine could be on tape or disk and entered into RAM at power-up. But lacking a terminal, the routine must also be part of the monitor in ROM so that it is operational as soon as power comes on. Some of the video-based monitors have it; some don't. But there is more to it than that.

Much user software—like BASIC interpreters, editors, disk operating systems, assemblers, etc.—monitors the keyboard, waiting for a break character such as a control-C. This function is usually performed directly by each program, rather than going

through the monitor.

When a PIA is used with a parallel keyboard, each such program must be patched to monitor the PIA rather than the standard ACIA. Not only is this a tedious job (for example, the instruction manual for the Gimix video board has 15 pages of patches and does not even cover all the possible programs), but it also means that the patched software is nonstandard and may not run on other systems. This is a definite liability, since one of the prime differences between SS-50 bus systems and S-100 systems has traditionally been the compatibility between different systems.

There is, of course, a solution. Don't use a PIA at all, but interface the parallel keyboard through an ACIA. This makes the interface truly transparent to all software and avoids

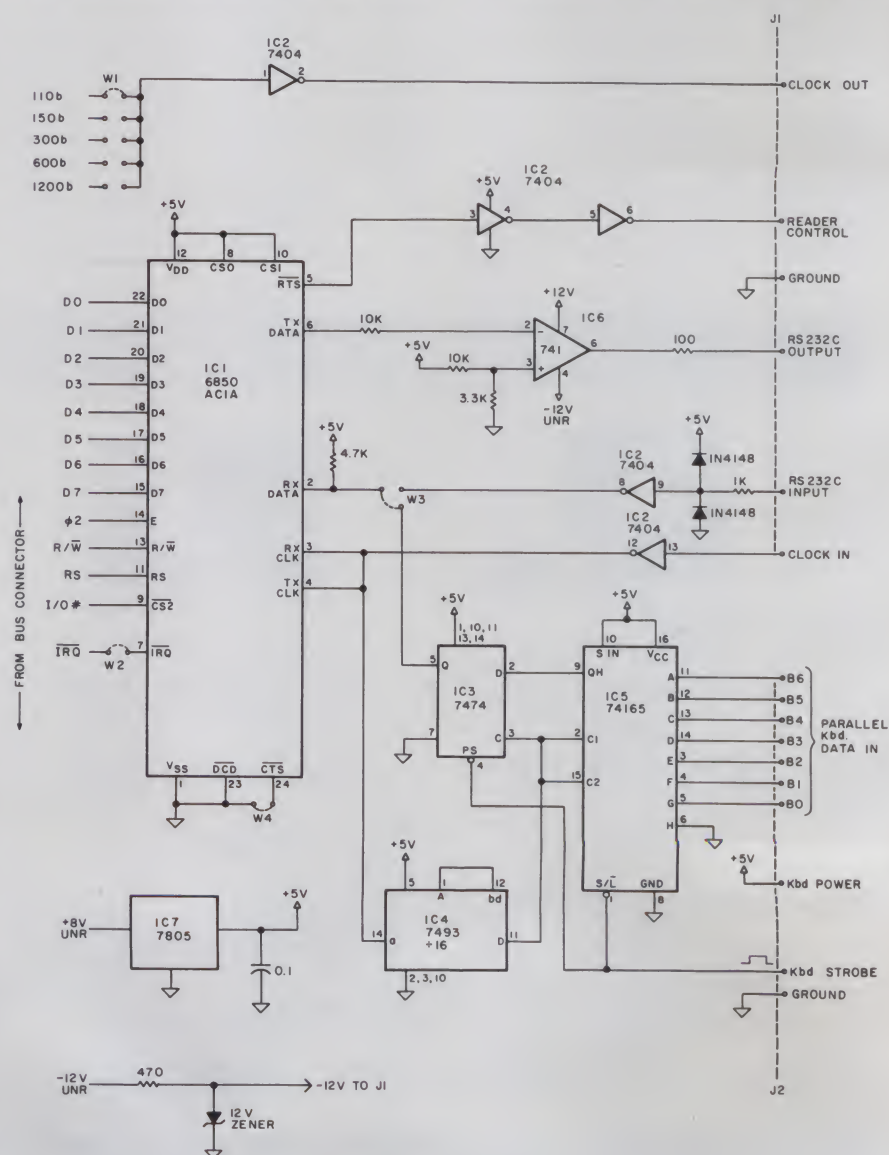


Fig. 1. Serial/parallel interface design.

AT LAST!

Mass production prices for high quality software. Buy direct and save 50%. Also available for CPM and HDOS.

DATA BASE MANAGER

Mod I & III \$69. \$149 (48K). Mod-II \$199
Maintain a data base and produce reports, all without user programming. Define file parameters and report formats on-line. Key random access, fast multi-key sort, field arithmetics, audit log, label. No time-consuming overlays. 500 happy users in one year. Mod-II and 48K versions have over 50 enhancements, including 40 fields maximum. 'IDM-M2 is great!' - 80-US.

A/R

Mod-I \$69. Mod-II \$149. Mod-III \$69
Handles invoices, statements, aging, sales analysis, credit checking, forms input, and order entry. Unlike other accounts receivable programs, ours can be used by doctors, store managers, etc.

WORD PROCESSOR

\$49
Centers, justifies, indents, and numbers pages. Mod-I version features upper/lower case without hardware modification! File merge option available.

MAILING LIST

Mod I & III \$59. \$79 (48K). Mod-II \$99
The best! Compare and be selective. Includes forms input, 5-digit selection code, zip code extension, sort on any field, and multiple labels. Who else offers a report writer and merges with word processor?

INVENTORY

Mod I & III \$89. \$109 (48K). Mod-II \$149
Fast key random access. Reports include order info, performance summary, EOQ and user-specified reports. Many people have converted to our system! Next to impossible to damage the file.

GL. A/R. A/P. PAYROLL

Mod-II \$129 each
Integrated accounting package. 100+ page manual. As opposed to Osborne's slow binary search and 64 column screen, we use fast ISAM and 80 columns. Dual disk and TRSDOS required.

L216

\$59
A cassette package of 10 business programs for Level II 16 K systems. Includes word processor and data base manager. Poker game \$19.

Most programs are on-line, interactive, random-access, bug-free, documented, and delivered on disks. Mod-I programs require 32K TRSDOS. We're #1 in business software—don't let our low price fool you! Ask for our free 20-page catalog if you're still not convinced. Compiled versions are available.



MICRO ARCHITECT, INC.
96 Dothan St., Arlington, MA 02174 ✓ 108

LEARN MICROPROCESSING ON YOUR OWN COMPUTER!

You Learn How To:

- Design and code microprocessor software
- Use logic and Bit Manipulation Techniques
- Enter and execute programs on your own computer
- Understand Microprocessor Architecture and Support Chips
- Control Programmable Input/Output Ports
- Implement Real-Time Interrupt Handling and Data Transfer
- Design your own microcomputer

You Receive:

- A fully tested and assembled 8085A Microcomputer with 1K RAM, 1K EPROM and 1k PROM Memory, Programmable I/O, Keyboard Unit, CPU Card, Display and Operating System, 44 pin edge connector can be configured to any bus structure, area on CPU Card for Custom wire-wrap design or user defined interface circuitry, completely expandable
- Complete Step-by-Step Instruction Manual
- Complete User's Manual with programs included
- 352 page 8085A Cookbook takes you from basic microprocessor concepts to actual design of an 8085A Microcomputer
- 344 page 8080/8085 Software Design Book 1 with over 190 executable program examples plus detailed examination of all 244 instructions and typical assembly language program for the 8080/8085 Microprocessor.



8085 MICROPROCESSOR
TRAINING UNIT \$299.95

**RATED BEST VALUE
BY INSTRUCTORS**

Satisfaction Guaranteed. If not completely satisfied you may return the product within 30 days for a full refund.



14905 NE 40th, Dept. KB 3
REDMOND, WA 98052 ✓ 19



FOR BANK CARD ORDERS:

CALL TOLL-FREE NUMBER:

1-800-426-6254 EXT 93

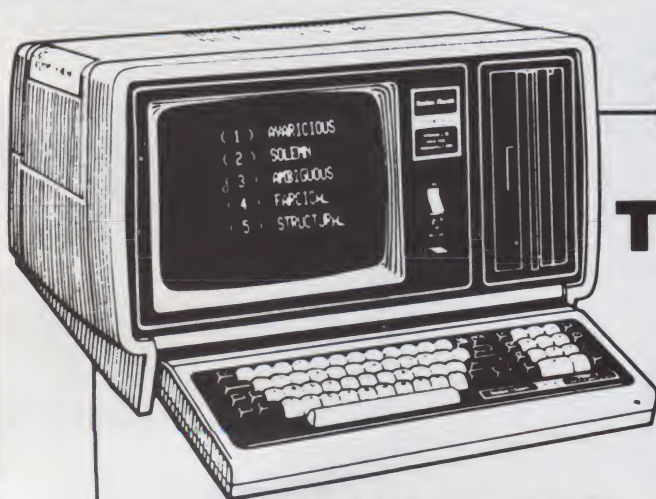


YES! I want to start learning Microprocessors. Please rush me:

☐ 8085AAT Microprocessor Training Unit at \$299.95 plus \$3.00 P & H

☐ 8085 Cookbook 21697 \$12.95 ☐ 8080/8085 Software Book 21541 \$9.50

NAME _____	CARD NO. _____
ADDRESS _____	EXP. DATE _____
CITY _____	<input type="checkbox"/> VISA <input type="checkbox"/> MASTERCARD
STATE _____ ZIP _____	SIGNATURE _____



TRS-80 MODEL II 64K \$3500

PACKS ENOUGH DATA HANDLING POWER FOR MANY SMALL BUSINESSES.

Radio Shack® DEALER TRS-80™ DISCOUNT

- ☐ NO OUT-OF-STATE TAX
- ☐ NO SHIPPING COSTS



**TRS-80 MODEL III
32K-2 DISKS**

\$2100

NEW PERSONAL COMPUTER...
REAL-TIME CLOCK, SHARPER
CRT IMAGES AND FASTER
LOADING CASSETTES



**TRS-80 COLOR
COMPUTER OR VIDEO \$339 each**

A LOW COST, COLOR COMPUTER FOR PERSONAL BUSINESS OR ENTERTAINMENT

CERTIFIED CHECKS
CASHIERS CHECKS
OR CREDIT CARDS



PERRY OIL & GAS INC. ✓ 266

137 NORTH MAIN STREET, PERRY, MICH. 48872
PHONE (517) 625-4161

WARRANTIES HONORED BY ALL RADIO SHACKS • T.M. TANDY CORP.

all incompatibilities. (And, in those systems which use interrupts for keyboard input—such as some of the sophisticated disk operating systems or multitasking systems—this approach is almost mandatory.)

On the surface that sounds impossible, but actually all it requires is that the parallel output of the keyboard be converted to serial, and that this serial signal then be fed to the ACIA as if it came from a terminal.

One approach is to put a parallel-to-serial converter right into the keyboard enclosure and use serial output directly. George Risk Industries makes such an adapter for their GRI keyboards, and similar adapters are also available from Electronic Systems and elsewhere. Though this simplifies the wiring between the keyboard and computer, it requires a more complicated power supply in the keyboard. Moreover, it is not necessarily an economical approach.

The second approach is to combine the serializer with the ACIA port together on one 30-pin interface card. Since the ACIA (and a UART, if used) would require TTL buffering of their I/O signals anyway, combining the parallel-to-serial conversion function on the same circuit board can solve the problem without any increase in circuitry by combining buffering and data conversion in the same set of ICs.

An excellent circuit for a serial/parallel interface board is shown in Fig. 1. This circuit provides not just a parallel keyboard input, but also a full RS-232C I/O port; either of these may be used individually, or both may be used together.

As Fig. 1 shows, a 6850 ACIA is used as in most other serial interfaces. It connects directly to the 30-pin I/O bus of the computer (with jumper W2 being used only when interrupt operation is desired).

Jumper W1 is used to select one of the baud rates; the desired baud rate clock is then buffered via a 7404 and sent out to the RS-232C interface connector. In the printed circuit board layout in Fig. 2, this connector is pin-for-pin compatible with that used on the SWTP MP-S card, and the clock is brought out so it may be used for terminal baud rate switching or for tape interface operation.

The clock input signal is again buffered and sent to pins 3 and 4 of the ACIA. In normal operation, the clock out and the clock in pins on the interface connector should be jumpered together. The buffering is included to eliminate data errors often present when an SWTP MP-S interface is separated from a tape interface by more than a foot or two of cable.

Serial RS-232 data is buffered with a 741 op-amp for output, and with another section of a 7404 inverter for input. The reader control line is also buffered by two inverters. Since this interface does not provide current-loop operation, this circuitry is much simpler than on other serial interfaces.

The major difference is in the circuit at the bottom. The seven bits of keyboard data (no parity bit is used) are sent to a 74165 shift register. This IC has eight inputs, one of which (pin 6) is permanently grounded to provide the 0 start pulse which always precedes a serial character.

The output of the shift register, on pin 9, goes to IC3, part of a 7474 type D flip-flop, which is normally kept set by a low on the PS (pre-set) input. The output of this flip-flop on pin 5 is thus normally high (representing a 1) between characters.

Since the ACIA requires a baud rate clock 16 times the actual baud rate, whereas the 74165 shift register requires a clock at the same baud rate, a 7493 divider divides the clock by 16.

The keyboard strobe must be normally low, with a high pulse extending over an entire one-character interval; that is, if the ACIA runs at 300 baud, then the strobe pulse must last for at least 1/30 second; at 1200 baud, it must last at least 1/120 second. This strobe pulse is normally low, which keeps the 74165 from shifting and keeps the 7474 set; when a character is received it goes high, which allows the 74165 and 7474 ICs to pass the data to the ACIA. (The serial input of the 74165, pin 10, is connected to +5 V so that the shift register fills up

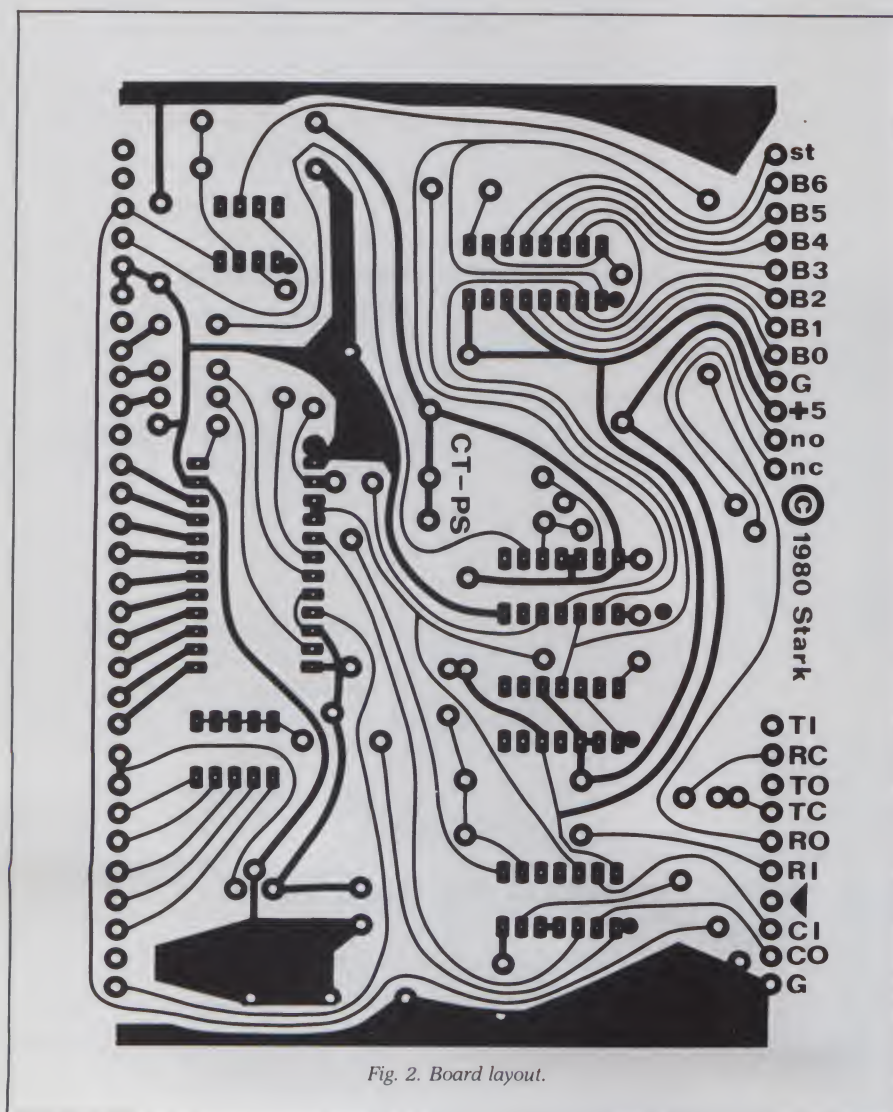


Fig. 2. Board layout.

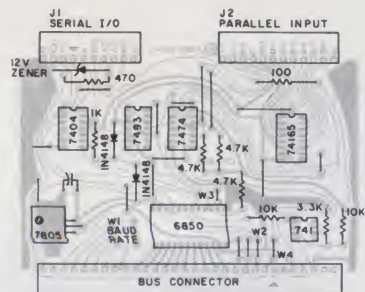


Fig. 3. Parts layout.

with ones as it shifts, and the character is automatically followed by a one stop bit.)

The position of jumper W3 depends on the input data source—it can connect the ACIA to either the 7404 in the serial terminal input or to the 7474 in the keyboard input circuit. If both inputs are to be used simultaneously, the jumper should be replaced by two diodes—both anodes go to ACIA, pin 2, with one cathode going to the 7404 output and the other to the 7474 output.

Power for the board is regulated by a 7805 three-terminal regulator; the

12 V zener diode and its resistor are required only when an I/O device (such as the Percom CIS-30 cassette interface) requires -12 V.

This circuit can be wired on a 30-pin prototyping card, or you can use the printed circuit board layout in Fig. 2; see Fig. 3 for the parts layout. A single-sided board makes construction easy. (If you'd rather obtain a commercial board than make your own, it is available from Star-Kits, PO Box 209, Mt. Kisco, NY 10549, for \$20 for a bare board, or \$55 for a complete kit of parts.)

The printed circuit board layout also has provisions for debouncing an abort switch (see January's installment). This circuit uses part of the 7474 flip-flop IC (Fig. 4).

A 6800 Cross Assembler

If you have switched to a 6809, but would like an inexpensive 6800 assembler that will run on your system (or if you just want to see how a 6800 assembler works) look at the Kilobaud Classroom No. 23 article in the December 1980 issue of *Kilobaud Microcomputing*. It describes a 6800/6802 cross assembler written in BA-

SIC. It runs on almost any system which supports a BASIC with strings. I've run it on a TRS-80 with very good results.

The Heath ET-3400 Trainer

Perhaps the most popular 6800-based computer ever made is the Heath ET-3400 Trainer. There have been tens of thousands of these sold to individuals, companies and schools. The trainer is actually part of a complete course on microcomputer fundamentals which has been very successful. (It is an excellent course; now that it is available in less expensive classroom-edition manuals, I highly recommend it to anyone who wants some more familiarity with his

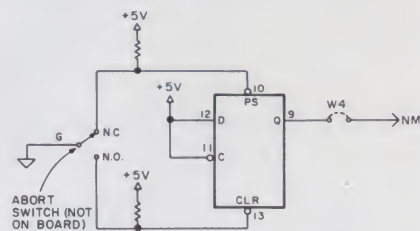


Fig. 4. Abort switch debouncing circuit on the interface board.

Model EP-2A-87
EPROM Programmer
NEW—CRT ENTRY MODE



The Model EP-2A-87 EPROM Programmer has an RS-232 compatible interface and includes a 2K or 4K buffer. During the ON-LINE mode, another computer can down-load to the buffer. Only two easy-to-implement commands are available to an external computer. (Load

buffer and read buffer.)

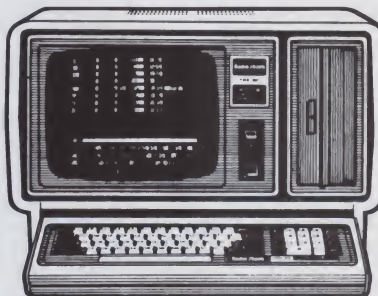
In the OFF-LINE mode, the EP-2A-87 will program, verify, test buffer, and load the buffer from the EPROM socket. During the programming cycle, the EPROM is checked before programming to insure that it is erased and after programming it automatically verifies that programming is correct. Power requirements are 115 VAC 50/60 Hertz at 15 watts.

Part No.	Description	Price
EP 2A 87 1	Programmer with 2K buffer	\$575.00
EP 2A 87 2	Programmer with 4K buffer	650.00
	Non standard voltage option (220 v, 240 v, 100 v)	15.00
PM 0	Personality Module, programs TMS 2708	18.00
PM 1	Personality module, programs 2708	18.00
PM 2	Personality module, programs 2732	34.00
PM 3	Personality module, programs TMS 2716	26.00
PM 4	Personality module, programs TMS 2532	34.00
PM 5	Personality module, programs 2716, TMS 2516	18.00
PM 6	Personality module, programs 2704	18.00
PM 7	Personality module, programs 2758, TMS 2508	18.00
PM 8	Personality module, programs Motorola MCM68764	36.00

Optimal Technology, Inc.
Blue Wood 127 ✓29
Earlysville, Virginia 22936
Phone (804) 973-5482

THE BIGGEST NAME IN LITTLE COMPUTERS™

TRS-80™ Model II—Your Best Buy In a Business Microcomputer



TRS-80™ computers, software and peripherals

Similar values on all **Radio Shack** merchandise

CALL COLLECT:

915-283-2920 ✓ 214
Van Horn Office Supply
 701 W. Broadway -- P O Box 1060
 Van Horn, Texas 79855



Radio Shack[®]

DEALER



THE NATIONWIDE SUPERMARKET OF SOUND®

LETTER QUALITY

ASCII
KSR
TERMINALS



\$1600

PERKIN-ELMER CAROUSELS: 132 column commercial quality word processing terminals complete with keyboard. Microprocessor controlled, internal buffer, full ASCII, RS-232 and 20 ms. nationwide maintenance. Fully described in 6 pages of specs, call or write for copy. From \$1600 FOB.

4027, 2104, 4096

75c



INTERSIL 4Kx1 DYNAMIC RAM: 300ms, ceramic, low power P/N 7005-12, equiv. to 4027, 2104, 4096. Priced at 1/3 the usual hobby price. Large OEM overstock results in giveaway price. New chips, satisfaction guaranteed. Sold only in original sleeves of 24, \$18 per sleeve, incl. UPS. Full specs with order or on request.

6 OUTPUT POWER SUPPLY
FLOPPY, EPROM, CPU ETC.

\$35

BRAND NEW NORTH: #3676, sealed boxes. Orig. used in NCR portable terminals: 5V/3A, 24V/1.2A, 16V/2.6A (all adjustable, w/OV prot. & curr. limiting), 12V/0.1A, 24V/0.3A (both w/OV prot.), 12V/0.1A (adj.). Fully regulated, conservative linear design, partially encl. w/sch. Assy. dwgs. & theory/service docs. 3.5 x 5.5 x 14" 115VAC. Runs an 8" floppy or drop the 16V to 12V and run 2-3 minifloppies. Guaranteed \$35 ea. + 12 lbs. UPS.

Write/call for info on other surplus bargains. Terminals, printers, power supplies, memory chips, core boards, etc.

TERMS: UPS COD, Visa, Master Charge on approval. COD + \$2. cards + 4% NJ add sales tax. Everything guaranteed working to specs. Immediate shipment or immediate refund.

ELECTRAVALUE INDUSTRIAL

P.O. BOX 157-K
MORRIS PLAINS, NJ 07950



Phone orders
are welcome.
201/267-1117

DISK-80 EXPANSION INTERFACE FOR THE TRS-80 MODEL I



- Disk controller (4 drives)
- Hardware data separator
- Buffered TRS-bus connector
- Real-time clock
- Printer port (optional)

ASSEMBLED & TESTED

with 16K RAM \$329.95

Centronics Printer

Port add \$ 50.00

with 32K RAM add \$ 50.00

DISK-80 pc board \$ 48.00

Printer/Power Supply

pc board \$ 16.00

Complete Kit with 16K
RAM and Printer Port \$275.00

The DISK-80 EXPANSION INTERFACE is Radio Shack hardware and software compatible and carries a 90 day warranty including parts and labor. Includes user's manual and power supply.

To order call (516) 374-6793

or write: The MicroMint Inc.

917 Midway
Woodmere, NY 11598



TRS-80 is trademark
of Tandy Corp.

Dealer
inquiries
invited.



Kilobaud Microcomputing will feature a special word processing issue in May. Manufacturers of word processing software for any microcomputer who want to be included in this issue should contact the Microcomputing editorial department immediately. Please send spec sheets of your software system. We will contact you if we need additional information.

6800 system.)

The basic trainer has a 6800, a 1K monitor in a 6830 ROM, 256 bytes of RAM (with sockets for 256 bytes more), a 17-key numeric keyboard, six-digit seven-segment LED readout, and a prototyping socket for doing the hardware experiments in the Heath microcomputer course. The circuitry of the trainer is specially buffered to simplify hardware interfacing, and the unit runs at a clock frequency of about 400 kHz to eliminate timing problems which might otherwise hamper some of the experiments. (Heath is also marketing a less expensive trainer which lacks the prototyping socket and buffering, and is intended only for software experiments.)

Heath also sells an add-on unit to the trainer, which adds from 1K to 4K more RAM, Tiny BASIC in ROM and a serial and cassette interface. Though this makes it possible to run BASIC on the system, it does not really allow much expansion beyond that.

Several readers have written for help in expanding the ET-3400 trainer into a full-fledged SS-50 bus system and asked me to devote an article to the subject. I cannot really recommend such a step. Even if it were completed, the trainer would only act as a CPU board; external memory and I/O interfacing, as well as a motherboard and power supply, would still be needed. With the large number of 6800 CPU boards available on the used market, it would certainly be easier, and cheaper as well, to sell the Heath trainer and start with a used but real SS-50 bus system.

Conversion of the trainer to run a full-fledged system involves four aspects:

1. The 6830 ROM must be replaced by a monitor which supports a serial terminal and is compatible with existing 6800 software. Several monitors (such as MIKBUG or SWTBUG) were available in a 6830 ROM, or else a 2708 or 2716 monitor could be adapted. With a 6830 some read-dressing is needed, since the trainer's 6830 EPROM occupies addresses FC00-FFFF, whereas standard monitors require E000-FFFF. With a 2708 or 2716, though, additional decoding would be needed, since the 6830 has five chip selects, while the 2708 or 2716 has only one. Either way, this would make the keyboard and LED readout on the trainer inoperable. While a custom monitor to allow

both a serial terminal and the Heath I/O gear could be written, it is not worthwhile.

2. The 256-byte RAM on the board must be disabled so that a larger external memory can be substituted.

3. More extensive buffering for an external bus must be added, and some mechanical arrangement provided to mount the trainer and a motherboard together. The mechanical work would be a kludge.

4. External memory and a serial port must be added. While these could be added on the prototyping socket, there isn't enough room for more than a few K of memory; besides, a more permanent arrangement would be desirable.

6800 Systems

Although SWTP has switched production from 6800 systems to 6809 systems, there are still several manufacturers who market 6800 systems and components. Not only are 6800 systems still popular with industrial users, who need systems to go with software they already have, but with hobbyists as well.

If you are in either category, here are some companies to contact:

Febe group (51 Hamilton Ave., York, PA 17404) makes a cabinet with motherboard, power supply and keyboard for either 6800 or 6809 systems.

Gimix, Inc. (1337 West 37th Place, Chicago, IL 60609) makes a hefty cabinet, motherboard and power supply, as well as both 6800 and 6809 CPU boards and other accessories.

Thomas Instrumentation (168 Eighth St., Avalon, NJ 08202) makes motherboards and other components, including a 6802 CPU board. The 6802 is compatible with the 6800 and runs the same programs.

Percom Data Co. (211 N. Kirby, Garland, TX 75042) also makes a 6802 CPU board.

And don't forget the 6802 single board computer featured in the Kilo-baud Classroom series published in this magazine.

6800/6809 Magazines

Several times I have mentioned the 68 Micro Journal (3018 Hamill Road, Hixson, TN 37343) in these pages. It specializes in 6800/6809 material. A newer magazine is the SS-50 Newsletter (PO Box 402, Logan, UT 84321). It is a slicker, easier to read magazine, whose content is improving as time goes on. ■

THE ORIGINAL MAGAZINE FOR OWNERS OF THE TRS-80™* MICROCOMPUTER

SOFTWARE
FOR TRS-80™
OWNERS

COMPUTRONICS INC.

MONTHLY
NEWSMAGAZINE
FOR TRS-80™
OWNERS

MONTHLY NEWSMAGAZINE Practical Support For Model I, II & III

- PRACTICAL APPLICATIONS
- BUSINESS
- GAMBLING • GAMES
- EDUCATION
- PERSONAL FINANCE
- BEGINNER'S CORNER
- NEW PRODUCTS
- SOFTWARE EXCHANGE
- MARKET PLACE
- QUESTIONS AND ANSWERS
- PROGRAM PRINTOUTS
- AND MORE

PROGRAMS AND ARTICLES PUBLISHED IN OUR FIRST 12 ISSUES INCLUDE THE FOLLOWING:

- A COMPLETE INCOME TAX PROGRAM (LONG AND SHORT FORM)
- INVENTORY CONTROL
- STOCK MARKET ANALYSIS
- WORD PROCESSING PROGRAM (FOR DISK OR CASSETTE)
- LOWER CASE MODIFICATION FOR YOUR VIDEO MONITOR OR PRINTER
- PAYROLL (FEDERAL TAX WITHHOLDING PROGRAM)
- EXTEND 16-DIGIT ACCURACY TO TRS 80™ FUNCTIONS (SUCH AS SQUARE ROOTS AND TRIGONOMETRIC FUNCTIONS)
- NEW DISK DRIVES FOR YOUR TRS-80™
- PRINTER OPTIONS AVAILABLE FOR YOUR TRS-80™
- A HORSE SELECTION SYSTEM***ARITHMETIC TEACHER
- COMPLETE MAILING LIST PROGRAMS (BOTH FOR DISK OR CASSETTE SEQUENTIAL AND RANDOM ACCESS)
- RANDOM SAMPLING***BAR GRAPH
- CHECKBOOK MAINTENANCE PROGRAM
- LEVEL II UPDATES***LEVEL II INDEX
- CREDIT CARD INFORMATION STORAGE FILE
- BEGINNER'S GUIDE TO MACHINE LANGUAGE AND ASSEMBLY LANGUAGE
- LINE RENUMBERING
- AND CASSETTE TIPS, PROGRAM HINTS, LATEST PRODUCTS
- COMING SOON (GENERAL LEDGER, ACCOUNTS PAYABLE AND RECEIVABLE, FORTRAN 80, FINANCIAL APPLICATIONS PACKAGE, PROGRAMS FOR HOMEOWNERS, MERGE TWO PROGRAMS, STATISTICAL AND MATHEMATICAL PROGRAMS (BOTH ELEMENTARY AND ADVANCED) AND

FREE*



WORD PROCESSING PROGRAM For writing letters, text, mailing lists, etc., with each new subscriptions or renewal.

LEVEL II RAM TEST Checks random access memory to ensure that all memory locations are working properly.

DATA MANAGEMENT SYSTEM Complete file management for your TRS 80™.

CLEANUP Fast action Maze Game.

ADVENTURE Adventure #0 by Scott Adams (From Adventureland International).

* All programs are supplied on cassette (add \$3 for Diskette Version - add \$5 for modified Mod-II Version).

FREE

* TRS 80™ IS A TRADEMARK OF TANDY CORP

SEND FOR OUR NEW 48 PAGE SOFTWARE CATALOG (INCLUDING LISTINGS OF HUNDREDS OF TRS 80™ PROGRAMS AVAILABLE ON CASSETTE AND DISKETTE). \$2.00 OR **FREE** WITH EACH SUBSCRIPTIONS OR SAMPLE ISSUE.

COMPUTRONICS INC.
MATHEMATICAL APPLICATIONS SERVICE™

50 N. PASCACK ROAD
SPRING VALLEY, NEW YORK 10977

ONE YEAR SUBSCRIPTION \$24

TWO YEAR SUBSCRIPTION \$48

SAMPLE OF LATEST ISSUE \$ 4

START MY SUBSCRIPTION WITH ISSUE

(#1 - July 1978 • #7 - January 1979 • #12 - June 1979 • #18 - January 1980)

NEW SUBSCRIPTION RENEWAL



24

**HOUR
ORDER
LINE**

(914) 425-1535



**NEW TOLL-FREE
ORDER LINE
(OUTSIDE OF N.Y. STATE)
(800) 431-2818**

CREDIT CARD NUMBER _____ EXP. DATE _____

SIGNATURE _____

NAME _____

ADDRESS _____ CITY _____ STATE _____ ZIP _____

*** ADD \$6 YEAR (CANADA, MEXICO) - ADD \$12 YEAR AIR MAIL - OUTSIDE OF U.S.A., CANADA & MEXICO ***

Protect Your Files From Prying Eyes

By Phil Hughes

Most microcomputers offer little protection against unauthorized access to data. There is, however, a way to ensure data privacy. Encryption will change a message into a form that is unintelligible to anyone without the converting information.

Most of us probably played with a simple form of encryption when we were children. For example, we might have written a note by converting each letter of the alphabet to the letter following it. Thus, Mary, I like you a lot. John became

NBSZ, J MJLF ZPV B MPU. KPIO.

Although this message is obscure at first, it is easy to decipher. The single letters J and B are the clues. English has only two single-letter words, so B and J represent A and I. Decoding should take only a couple of minutes.

Generating Encrypted Messages

With a computer system, you should be able to generate encrypted messages that are much more difficult to decrypt.

One simple method is to use an exclusive OR (XOR) to replace each character in the message with a character in a key (see Table 1). If this is done with a message in ASCII code, an assortment of printable and non-printable (control) characters is produced.

For example, encrypt the word MARY using the key 3ZRB. First convert the ASCII characters to their binary equivalents. Using a conversion

table, you get Example 1.

If you execute an exclusive OR on these two lines, the result is shown in Example 2.

Now comes the real advantage of XOR. The XOR operation is symmetrical; applying it a second time will undo what it did the first time. See Example 3.

If you try to apply this encryption method, you may run into trouble with what the operating system does with the control codes that are generated. This happened to me with the Flex operating system. I decided, therefore, to only encrypt the printable characters, and leave the control codes, such as carriage return, as they were.

Thus, I also had to cause the resulting characters to have values greater than the valid control codes. My final algorithm is shown in Example 4.

Also, the length of the key is generally shorter than the message. I handled this by reusing the characters in the key as many times as required to complete the encryption. For example, if the message is

```
MARY = 0100 1101 0100 0001 0101 0010 0101 1001
3ZRB = 0011 0011 0101 1010 0101 0010 0100 0010
```

Example 1. Converting ASCII characters to their binary equivalents.

```
0111 1110 0001 1011 0000 0000 0001 1011
```

Example 2. Executing an exclusive OR.

```
THIS IS A SECRET
and the key is
HIDE
```

then the character-by-character XOR is performed by repeating HIDE the required number of times. Thus,

```
THIS IS A SECRET!
HIDEHIDEHIDEHIDEH
```

Programs

Listing 1 is an implementation of this encryption method in 6800 assembler language. Most of the program is for interfacing to the file management system, getting the parameters and checking for errors. The actual encryption takes place in lines 209-220.

Listing 2 is an example using Crypt. First, using the build utility, you create a data file named Message. You then list the contents of the file, using

```
result = 0111 1110 0001 1011 0000 0000 0001 1011
3ZRB = 0011 0011 0101 1010 0101 0010 0100 0010
```

```
result in:
0100 1101 0100 0001 0101 0010 0101 1001
```

which is MARY.

Example 3. Applying XOR to the result in Example 2, using the encryption key.

```
IF NOT control character THEN
Subtract hexadecimal 20 from character
Perform XOR
Add hexadecimal 20 to result
```

Example 4.

Phil Hughes, PO Box 2847, Olympia, WA 98507.


```

++BUILD MESSAGE
=This is the message.
=It will be encrypted and then it will
=be decrypted.
=Watch what happens.
=#
++LIST MESSAGE
This is the message.
It will be encrypted and then it will
be decrypted.
Watch what happens.

+++CRYPT,MESSAGE,HIDDEN,FRAMUS
++LIST HIDDEN
!(>u:5r5Z0s+72>44#!
!s1;-!u1#r$6!?'*5(1s'<%m!;#<a$!s1;-!
!#rX(6!?'*5(1)
96;fX);!s,31=0=5!

+++CRYPT,HIDDEN,FOUND,FRAMUS
++LIST FOUND
This is the message.
It will be encrypted and then it will
be decrypted.
Watch what happens.

```

Listing 2. Using Crypt.

```

+++CRYPT,MESSAGE,F1,WEIRD
+++CRYPT,F1,F2,STRANGE
++LIST F2
Pur`*us:r"s+crdsvoy-
_i rpn`!r`$b(bvvhkgot <hr6fry#`!<t{zo
s!`hdsu)wad`?
Dkdcra~jz7bsxyma8

+++CRYPT,F2,G1,STRANGE
+++CRYPT,G1,G2,WEIRD
++LIST G2
This is the message.
It will be encrypted and then it will
be decrypted.
Watch what happens.

+++CRYPT,F2,H1,WEIRD
+++CRYPT,H1,H2,STRANGE
++LIST H2
This is the message.
It will be encrypted and then it will
be decrypted.
Watch what happens.

```

Listing 3. Encrypting Message, using the key Weird and the key Strange.

the list utility. Next, you encrypt Message into the file Hidden, using Framus as the key. The contents of Hidden show little resemblance to the original contents of Message.

Finally, Crypt is run once again,

this time using Hidden as input, Found as output and—again—Framus as the key. Listing Found shows that the message has been restored to its original form.

For those wishing to make the mes-

sage even harder to decode, Crypt can be repeated using different keys. Listing 3 shows Message being encrypted, first using the key Weird and then the key Strange. Because of the symmetry of the XOR operation, the decryption can be performed in either order. This is also demonstrated in Listing 3. ■

Listing 1. Implementation of encryption method in 6800 assembler language.

```

1      0000      NAM  CRYPT      - File encryption utility
2      0000      OPT  XRF
3
4      * Copyright 1979, Specialized Systems Consultants
5      *
6      * COMMAND:
7      *   CRYPT,filespec1,filespec2,key
8      *
9      *   where filespec1 is the input file
10     *   filespec2 is the output file and
11     *   key is the encryption key
12
149     0000      OPT  PNT
150
151     0078      * KBLN EQU 120      key buffer length
152
153
154     0000      CRYPT EQU *
155 3R 0000 CE 0154 LDX #RFCB
156 12 * 0003 BD AD2D JSR GETFIL      input file
157 16 * 0006 24 03 (000B) BCC $10
158 3R 0008 7E 00A6 JMP ERROR
159 2R 000B 86 01 LDA A #FEXT.TXT default ext
160 11 * 000B BD AD33 JSR SETEXT
161 14 * 0010 CE 0294 LDX #WFCB
162 23 * 0013 BD AD2D JSR GETFIL      output file
163 27 * 0016 24 03 (001B) BCC $99
164 3R 0018 7E 00A6 JMP ERROR
165 2R 001B 86 01 LDA A #FEXT.TXT default ext
166 11 * 001D BD AD33 JSR SETEXT
167
168 14 * 0020 CE 00DC * Get the key
169 16 * 0023 5F LDX #KEYBUF
170 25 * 0024 BD AD27 CLR B
171 29 * 0027 24 0E (0037) JSR NXTCH
172 3R 0029 CE 00CA BCC GKOK
173 12 * 002C BD AD1E LDX #BKMSG      bad key
174 15 * 002F 7E AD03 JSR PSTRNG
175 9R * 0032 BD AD27 JMP WARMS
176 13 * 0035 25 0A (0041) JSR NXTCH      get character
177 2R 0037 5C BCS GKDONE      end of key
178 4 * 0038 C1 78 INC B
179 8 * 003A 2C ED (0029) CMP B #KBLN      too long?
180 6R 003C A7 00 BGE BADKEY      yes
181 10 * 003E 08 STA A 0,X      save char
182 14 * 003F 20 F1 (0032) INX
183 2R 0041 81 0D BRA GKLOOP      get next char
184 6 * 0043 27 05 (004A) CMP A #X'D'      valid terminator?
185 4R 0045 B1 AC02 BEQ GKTERM      yes
186 8 * 0048 26 DF (0029) CMP A F2E0L
187 5R 004A F7 00D9 BNE BADKEY      no
188 * Open the files STA B KEYLEN      save
189 8 * 004D CE 0154 LDX #RFCB

```

More

XOR	0	1
0	0	1
1	1	0

Table 1. Truth table for exclusive OR (XOR). The result is 1 if the two inputs have different values and 0 if the two inputs are the same.

Subscription Problem?

Kilobaud Microcomputing does not keep subscription records on the premises, therefore calling us only adds time and doesn't solve the problem.

Please send a description of the problem and your most recent address label to:

**Kilobaud Microcomputing
Subscription Dept.
PO Box 997
Farmingdale, NY 11737**

Thank you and enjoy your subscription.

MARK GORDON COMPUTERS

DIVISION OF MARK GORDON ASSOCIATES, INC.

P.O. Box 77, Charlestown, MA 02129
(617) 491-7505

✓84

COMPUTERS

Atari 800 W16K	799.00
Level-II 16K System	659.00
Model-II 64K System	3499.00
16K Model III	859.00

DISK DRIVES

40 Track 5 1/4 inch drive	314.00
80 Track 5 1/4	544.00
4 Disk Drive Cable	39.00

PRINTERS

Centronics 730	599.00
Epson MX80B	499.00
Centronics 737	849.00
Okidata Microline 83	1044.00
Integral Data 440G	999.00
NEC 5510 w-tractor	2679.00
Okidata Microline 80	599.00
Diablo 630	2495.00

MISC HARDWARE

Expansion int. TRS-80(Ok)	249.00
Novation Cat modem	159.00
16K Memory Kit	41.99
Leedex Monitor	109.00
Printer Cable for above	49.00
ISO-2 Isolator	54.00
AC LINE FILTER	24.00

STORAGE MEDIA

Verbatim-box 10-5 1/4	25.00
Memorex-box 10-5 1/4	22.00
Plastic Storage Box	5.00

OPERATING SYSTEMS

NEWDOS by APPARAT INC.	49.00
NEWDOS+ by APPARAT INC.	99.00
MMS FORTH DISKETTE-PRIMER	79.95
NEWDOS 80	149.00

DISKETTE TRS-80*

BUSINESS SOFTWARE BY SBSG

Free enhancements and upgrades to registered owners for the cost of media and mailing. 30 day free telephone support. User reference on request.

Fully Interactive Accounting Package, General Ledger, Accounts Payable, Accounts Receivable and Payroll, Report Generating.

Complete Package (requires 3 or 4 drives) **\$475.00**

Individual Modules (requires 2 or 3 drives) **\$125.00**

Inventory II: (requires 2 or 3 drives) **\$ 99.00**

Mailing List Name & Address II (requires 2 drives) **\$129.00**

Intelligent Terminal System ST-80 III. **\$150.00**

The Electric Pencil from Michael Shrayser **\$150.00**

File Management System: **\$ 49.00**

FINE PRINT

TRS-80 is a Tandy Corporation trademark. Use of above operating systems may require the use of Radio Shack TRS-DOS. Radio Shack equipment subject to the will and whim of Radio Shack.

ORDERING INFORMATION

We accept Visa and MasterCard. We will ship C.O.D. certified check or money orders only. Massachusetts residents add 5 percent sales tax.

To order call toll-free 1-800-343-5206

For information call 617-491-7505

The Company cannot be liable for pictorial or typographical inaccuracies.

Listing 1 continued.

190	10	0050	86	01	LDA A	#F20PR	read
191	16	0052	A7	00	STA A	#B2FNC,X	
192	25	* 0054	BD	B406	JSR	FMS	
193	29	0057	26	4D (00A6)	BNE	ERROR	
194	2R	0059	86	FF	LDA A	#X'FF'	disable
195	8	005B	A7	38	STA A	#B2SCF,X	space comp
196	11	005D	86	0294	LDX	#WFCB	
197	13	0060	86	02	LDA A	#F20PW	write
198	19	0062	A7	00	STA A	#B2FNC,X	
199	28	* 0064	BD	B406	JSR	FMS	
200	32	0067	26	3D (00A6)	BNE	ERROR	
201	2R	0069	86	FF	LDA A	#X'FF'	disable
202	8	006B	A7	38	STA A	#B2SCF,X	space comp
203	11	006D	CE	00DC	LDX	#KEYBUF	point to key
204	17	0070	FF	00DA	STX	KBPTR	
205	21	0073	F6	00D9	LDA B	KEYLEN	key char count
206	3R	0076	CE	0154	LDX	#RFCB	
207	12	* 0079	BD	B406	JSR	FMS	get char
208	16	007C	26	22 (00A0)	BNE	CHKSTAT	
209	5R	007E	FE	00DA	LDX	KBPTR	
210	7	0081	81	20	CMP A	#X'20'	
211	11	0083	28	06 (008B)	BMI	\$40	
212	2R	0085	80	20	SUB A	#X'20'	
213	7	0087	A8	00	EOR A	0,X	
214	9	0089	88	20	ADD A	#X'20'	
215	4R	008B	08		INX		
216	6	008C	5A		DEC B		
217	10	008D	26	06 (0095)	BNE	SVPTR	
218	4R	008F	F6	00D9	LDA B	KEYLEN	restore key length
219	7	0092	CE	00DC	LDX	#KEYBUF	and buffer ptr
220	6R	0095	FF	00DA	SVPTR	STX	KBPTR
221	9	0098	CE	0294	LDX	#WFCB	
222	18	* 009B	BD	B406	JSR	FMS	put char
223	22	009E	20	06 (0076)	BRA	LOOP	get next
224					* Check status		
225	5R	00A0	E6	01	CHKSTAT	LDA B	#B2ESB,X
226	7	00A2	C1	08	CMP B	#8	get status
227	11	00A4	27	03 (00A9)	BEQ	DONE	EOF?
228	9R*	00A6	BD	AD3F	ERROR	JSR	RPTERR
229					* Close files		report error
230	3R	00A9	CE	0154	DONE	LDX	#RFCB
231	5	00AC	86	04	LDA A	#F2CLF	
232	11	00AE	A7	00	STA A	#B2FNC,X	
233	20	* 00B0	BD	B406	JSR	FMS	
234	24	00B3	27	03 (00B8)	BEQ	\$20	
235	9R*	00B5	BD	AD3F	JSR	RPTERR	close error
236	3R	00B8	CE	0294	LDX	#WFCB	
237	5	00BB	86	04	LDA A	#F2CLF	
238	11	00BD	A7	00	STA A	#B2FNC,X	
239	20	* 00BF	BD	B406	JSR	FMS	
240	24	00C2	27	03 (00C7)	BEQ	\$40	
241	9R*	00C4	BD	AD3F	JSR	RPTERR	close error
242	3R	00C7	7E	AD03	JMP	WARMS	return to U.S.
243					* DATA AREA		
244							
245							
246		00CA	2A2A20494E56	BKMSG	CON	C'** INVALID KEY',4	
247		00D9		KEYLEN	RMB	1	key length
248		00DA		KBPTR	RMB	2	buffer pointer
249		00DC		KEYBUF	RMB	KBLEN	key buffer
250		0154		RFCB	RMB	320	input FCB
251		0294		WFCB	RMB	320	output FCB
252							
253		03D4			END	CRYPT	
AD36	ADDBX	137					
0029	BADKEY	172	179	186			
00CA	BKMSG	246	172				
00A0	CHKSTAT	225	208				
AD21	CLASS	130					
AD00	COLDS	119					
0000	CRYPT	154	253				
AD4B	DOCMND	144					
00A9	DONE	230	227				
00A6	ERROR	228	158	164	193	200	
AC00	F2BACK	78					
AC29	F2CCOL	109					
AC28	F2COMF	108					
AC18	F2CURC	96					
AC07	F2DEC	85					
AC01	F2DEL	79					
AC03	F2DEPC	81					
AC08	F2EJC	86					
AC02	F2ENV	111					
ACU2	F2EOL	80	185				
AC16	F2ERR	95					
AC2U	F2ERRT	102					
AC0A	F2ESC	88					
A840	F2FCB	113					
AC26	F2FIA	107					
AC2F	F2FIEF	112					
AC24	F2FOA	106					
AC23	F2INSW	105					
AC11	F2LAST	92					
AC14	F2LBP	94					
A080	F2LBUF	77					
AC1B	F2LDAO	99					
AC1A	F2LINE	98					
AC2B	F2MEND	110					
AC05	F2NULL	83					
AC22	F2OTSW	104					
AC09	F2PAUS	87					
AC19	F2PREC	97					

DR. DALEY OFFERS SOFTWARE FOR EVERYONE

DATA BASE

The data base package allows total user control over the contents of each entry in the file. Features user selectable record size from 5 to 242 characters per record, statistical and plotting package, output with WORDPRO files or printer. Includes full user definable output formatting. With optional indexing routine can produce a comprehensive index of a data set.

Index \$299.95
 99.95

For PET or CBM 2000 or 8000 series with 32K memory please specify your machine configuration.

MAIL LIST

This powerful mailing list package features a variety of options for producing labels. It includes user defined file structure and label format. Label format can list to the printer or to WORDPRO format files.

\$159.95

SOFTWARE LIBRARY

Hundreds of schools and individuals have purchased this package for use as an educational tool or just plain fun. It contains 50 (yes fifty!) programs. This ranges from our famous TREK 3 and horse race to fun learning programs for children to checkbook and a micro mail list program with lots in between. At about \$1.40 per program how can you miss?

Cassette \$69.95
Diskette 79.95
For APPLE II or PET

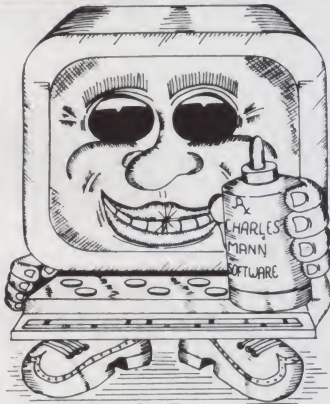
Charge to
your
MC/VISA



DR. DALEY'S SOFTWARE ✓34

425 Grove, Berrien Springs, Michigan 49103

Phone (616) 471-5514 Sunday-Thursday noon to 9 p.m. Eastern Time



CURE TO SOFTWARE PROBLEMS

PROFESSIONAL SOFTWARE

Medical, Dental & Legal Systems,
Accounting & Financial, Educational,
Word Processing, Office Management

Check your Local Dealer or Contact:

Charles Mann & Associates ✓165
7594 San Remo Trail
Yucca Valley, Ca. 92284
(714) 365-9718

Apple II

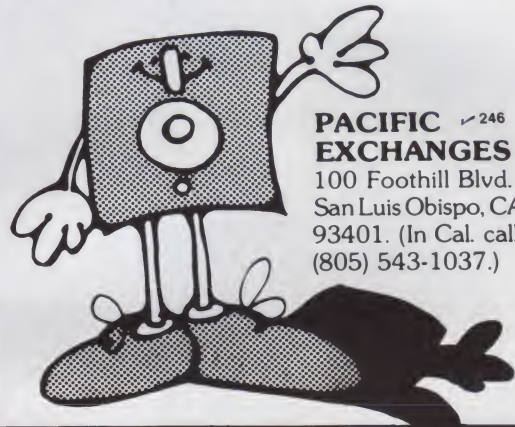
TRS-80

TI 99/4

MEMOREX DISKETTES & CARTRIDGES

for your computer or word processor

BUY THE BEST FOR LESS.
Lowest prices. **WE WILL NOT
BE UNDERSOLD!!** Buy any
quantity. Call free (800) 235-
4137 for prices and information.



PACIFIC ✓246
EXCHANGES
100 Foothill Blvd.
San Luis Obispo, CA
93401. (In Cal. call
(805) 543-1037.)

SPECTACULAR OFFERS

BASF "FLEXIDISK"...
Superior Quality data storage medium.
Certified and guaranteed 100% error free.

SINGLE SIDED-SINGLE DENSITY

5 1/4" or 8" Diskettes 10/\$24
5 1/4" or 8" Vinyl Storage Pages 10/\$5

MAXELL-DISKETTES

The best quality diskette money can buy.
Approved by Shugart and IBM.

Sold only in boxes of 10

5", 1-side \$3.30
8", 1-side \$4.25
5", 2-side \$3.90
8", 2-side \$5.60

ALL MAXELL DISKETTES ARE DOUBLE DENSITY

LIBRARY CASE...

3-ring binder album.
Protects your valuable programs on disks.
Fully enclosed and protected on all sides.
Similar to Kas-sette storage box.

Library 3-Ring Binder \$6.50
5 1/4" Mini Kas-sette/10 \$2.49
8" Kas-sette/10 \$2.99

DISKETTE DRIVE HEAD CLEANING KITS

Prevent head crashes and insure efficient, error-free operation.

5 1/4" or 8" \$19.50

SFD CASSETTES

C-10 Cassettes 10/\$7

(All cassettes include box & labels)

Get 8 cassettes, C-10 sonic and Cassette 8 library album for only \$8.00
(As illustrated)

HARDHOLE

Reinforcing ring of tough mylar protects disk from damage

8" Applicator \$4 5 1/4" Applicator \$3
50/8" Hardholes \$8 5 1/4" Hardholes \$6

VISA • MASTERCHARGE • MONEY ORDERS
CERTIFIED CHECK • FOR PERSONAL CHECKS
ALLOW TWO WEEKS • C.O.D. REQUIRES A 10%
DEPOSIT • CAL. RES. ADD 6% SALES TAX
MIN \$2 SHIPPING & HANDLING • MINIMUM
ORDER \$10 • SATISFACTION GUARANTEED
OR FULL REFUND

Write for our free catalog

ABM PRODUCTS

273

**631 B ST.
SAN DIEGO, CA 92101
(714)235-6602**

kilobaud
MICRO

COMPUT

TING T.M.

kilobaud
MICRO

COMPUT

TING T.M.

kilobaud
MICRO

COMPUT

TING T.M.

Listing 1 continued.

AC0E	F2SDR	91				
AC0B	F2SDRV	89				
AC21	F2SIOF	103				
AC06	F2TABC	84				
AC1D	F2TRAN	100				
AC1E	F2TRNA	101				
A100	F2UCA	114				
AC12	F2UCTA	93				
AC0C	F2WDRV	90				
AC04	F2WIDC	82				
0002	FB2ACT	41				
004U	FB2HUF	59				
002F	FB2CDA	56				
0020	FB2CRN	52				
001E	FB2CUR	51				
0003	FB2DRV	42				
0013	FB2EDA	47				
0001	FB2ESB	40	225			
000C	FB2EXT	44				
000F	FB2FAT	45				
0032	FB2FDP	57				
001C	FB2FLP	50				
0000	FB2FNC	39	191	198	232	238
0022	FB2INX	53				
0004	FB2NAM	43				
0024	FB2NWB	55				
0023	FB2RDX	54				
003B	FB2SCF	58	195	202		
0011	FB2SDA	46				
0015	FB2SIZ	48				
0017	FB2SMI	49				
0008	FEXT.BAC	70				
0005	FEXT.BAK	67				
0003	FEXT.BAS	65				
0000	FEXT.BIN	62				
0002	FEXT.CMD	64				
0007	FEXT.DAT	69				
0009	FEXT.DIR	71				
000B	FEXT.OUT	73				
000A	FEXT.PRT	72				
0006	FEXT.SCR	68				
0004	FEXT.SYS	66				
0001	FEXT.TXT	63	159	165		
0000	FL2IO	16				
0016	FM2BOR	35				
0004	FM2CLF	20	231	237		
000C	FM2DLF	27				
0014	FM2FND	33				
0007	FM2GIR	23				
0011	FM2GRB	31				
000F	FM2NSS	29				
0006	FM2OPD	22				
0001	FM2OPR	17	190			
0003	FM2OPU	19				
0002	FM2OPW	18	197			
0010	FM2OSI	30				
0008	FM2PIR	24				
0015	FM2POS	34				
0012	FM2PRB	32				
000D	FM2RNF	28				
0009	FM2RSS	25				
0005	FM2KWF	21				
000A	FM2WSS	26				
B400	FMINIT	145				
B406	FMS	147	192	199	207	222 233 239
B403	FMSCLS	146				
AD15	GETCHR	126				
AD2D	GETFIL	134	156	162		
AD42	GETHEX	141				
0041	GKDONE	183	176			
0032	GKLOOP	175	182			
0037	GKOK	177	171			
004A	GKTERM	187	184			
AD1B	INBUFF	128				
AD09	INCH	122				
AD0C	INCH2	123				
AD48	INDEC	143				
0078	KBLEN	151	178	249		
00DA	KBPTR	248	204	209	220	
00DC	KEYBUF	249	168	203	219	
00D9	KEYLEN	247	187	205	218	
AD30	LOAD	135				
0076	LOOP	206	223			
AD27	NXTCH	132	170	175		
AD45	OUTADR	142				
AD0F	OUTCH	124				
AD12	OUTCH2	125				
AD39	OUTDEC	138				
AD3C	OUTHEX	139				
AD24	PCRLF	131				
AD1E	PSTRNG	129	173			
AD18	PUTCHR	127				
AD06	RENTER	121				
0154	RFCB	250	155	189	206	230
AD3F	RPTERR	140	228	235	241	
AD2A	RSTRIO	133				
AD53	SETEXT	136	160	166		
0095	SVPTR	220	217			
AD03	WARMS	120	174	242		
0294	WFCB	251	161	196	221	236

SAVE!

WITH DSC'S 10% CLUB

- YOU CAN BUY HARDWARE, SOFTWARE, AND SUPPLIES AT 10% ABOVE WHOLESALE
- JOIN NOW: \$15.00 ANNUAL MEMBERSHIP FEE INCLUDES \$10.00 CREDIT TOWARD FIRST PURCHASE AND CATALOG OF PRODUCTS
- TERMS — PREPAYMENT, CASH, CERTIFIED CHECK, M.O., M.C. AND VISA ADD 4%, FOB PHILA., PA.
- WARRANTIES — ALL EQUIPMENT CARRIES MANUFACTURER'S WARRANTY AND WILL BE SERVICED BY MANUFACTURER OR REPRESENTATIVE

COMPUTERS

Intertec - SuperBrain 32K	2375.
SuperBrain 64K	2500.
SuperBrain QD 64K	2990.
Intertube III	724.
Atari - 400 Computer	475.
800 Computer	746.
815 Dual Disk Drive	1159.
Apple II + Apple II Plus - 16K	959.
32K	1049.
48K	1149.
Drives - Lobo for Apple - 5 1/4" with controller	442.50
VR Data - 40tk 1 side	309.
80tk 1 side	439.
40tk 2 side	439.
80tk 2 side	619.
8" CDC 9404B, Mod II comp.	749.
16K memory	28.95
Modems - D-Cat direct connect	150.
Lexicon acoustic	129.95
Radio Shack - Mod. I Expansion Interface	246.40
Model III 16K	869.
Model III 32K w/2 Drives	2199.
Color Computer 4K	345.
Color Computer 16K	520.

PRINTERS

Centronics - 730-1 parallel	594.
730-3 serial	649.
737-1 parallel	715.
737-3 serial	799.
704-9 RS-232 serial	1599.
Anadex - 8000	794.
NEC - 5510 w/tractor	2490.
C. Itoh Starwriter 25 cps parallel	1279.

SUPPLIES

Verbatim Diskettes - 5 1/4" MD-01 Data Life	26.90/10
550-01, DD	37.50/10
8" FD-34-9000-Data Life	32.40/10
Nashua Diskettes - 5 1/4" (high quality)	22.95/10
8" DD, FD-1D-WP	32.50/10
Dysan - 5 1/4" SS-SD	24.50/5

ALL BRANDS OF HARDWARE, SOFTWARE, PERIPHERALS, SUPPLIES AND BOOKS ARE AVAILABLE.

I WANT TO JOIN NOW.

NAME _____
 STREET _____
 CITY _____ STATE _____ ZIP _____
 CHARGE ☐ MASTER CHG. ☐ VISA
 CARD NUMBER _____
 EXPIRATION DATE _____

DISK SUPPLY Co.

SUITE 439, 111 S. OLIVE ST. MEDIA, PA 19063
 (215) 461-5437



COMPUTER INTERFACES
& PERIPHERALS

- POS-100 NRZ1 TAPE DRIVE CONTROLLER/FORMATTER — Now your micro can read and write IBM/ANSI compatible NRZ1 format 9-track magnetic tapes. The POS-100 consists of S-100 bus card, 6' ribbon cable, tape drive controller card, cable to Pertec-Standard NRZ1 Tape drive, plus documentation and Z-80 or 8080 software (specify). Power is derived from tape drive and S-100 bus. Ship Wt.: 10 lbs. Suggested Retail Price \$995.00
- POS 103/202 "MIX or MATCH" MODEM — Unique POS control design permits use in one housing of both Bell-compatible 103 (0-300 baud) and 202 (0-1200 baud) modem modules originally made by VADIC Corp. for a telephone company subsidiary. FEATURES: RS-232 serial Interface, auto-answer, auto-dial, LED display, telephone line interface via acoustic coupler, manual DAA, or auto-answer DAA (sold separately). FULLY ADJUSTED; no special tools required. 3,000 mile range over standard dial-up telephone lines. Ship wt.: 15 lbs.
- PRICES POS 103 Modem — \$199.95; POS 202 Modem — \$299.95; POS 202 Modem w/Auto-Answer — \$349.95; POS 103/202 Modem — \$499.95; FCC-Approved Auto-Answer DAA — \$125.00; Acoustic Coupler — \$29.95.
- POS DAISY-WHEEL PRINTER INTERFACE for TRS-80 — Will drive Diablo HyType I, HyType II, and Qume Q and Sprint 3 printers. Includes 1K user-available memory for custom print routines (such as graphics, bidirectional printing, etc.). Programmed to respond to print commands from BASIC ELECTRIC PENCIL™ and SCRIPSIT™ software. Draws its power from printer. Ship wt.: 5 lbs. Price \$250.00
- Cables, each (Specify HyType I, HyType II, or Qume) \$ 25.00
- POS ASCII INTERFACE for IBM I/O SELECTRIC — This Centronics-style parallel printer interface will drive an IBM Model 731 or 735 I/O typewriter (EBCD and Correspondence codes). No software needed. Features on-board EPROM which holds up to 8 ASCII-to-IBM code tables for different type spheres. Closed-loop operation runs at maximum printer speed; stops and starts on a single character without loss of data. Requires +12VDC and ±5VDC power source. Ship wt.: 5 lbs. Price \$249.95
- Power Supply (+5VDC, +12VDC, +24VDC for Solenoids on Printer) \$ 49.95
- CONVERT OFFICE SELECTRIC TO I/O TYPEWRITER — Kit includes assembled solenoids, switches, wire harness, magnet driver PCB plus instructions for installation and mCPU interface. Price \$150.00
- "FORMALINER" Variable Width Forms Tractor for 15" Selectrics . . . \$95.00
- GTE Model 560 ASCII SELECTRIC I/O Terminal — With RS-232 Serial Interface and digital cassette deck for use as memory typewriter. Ship wt.: 100 lbs. Price, tested and adjusted \$1,195.00
- POS ASCII IBM SELECTRIC PRINTER — 15" Selectric from GTE terminal cleaned and adjusted with POS Centronics-style ASCII printer interface, UC/LC, carbon and fabric ribbons. Compatible with TRS-80, Apple, SOL and other CPU parallel printer ports. Ship wt.: 75 lbs. Price \$895.00

PACIFIC OFFICE SYSTEMS ✓ 153

918 Industrial Avenue

Palo Alto, CA 94303

(415) 493-7455

FOR OSI COMPUTERS

★ SMARTERM ★

An 'Intelligent' Terminal Software System
for OSI Computers by Phil Lindquist

- Even, Odd, or No Parity Use-Selected
- Full or Half Duplex Operation
- User Controlled Storage of Incoming Data
- Stored Data Printed or Saved on Disk
- Saved Data Recalled For Review or Output
- Control Key Initiation of LOGON Messages

- Join The Micro Communications Revolution -

C2-4P MF, C4P MF Systems \$19.95
 C2-8P DF, C8P DF, C4P DF Systems \$23.95

Order From:

COMPUTER CONNECTION, INC.

38437 Grand River • Farmington Hills, Mich. 48018

Dealer Inquiries Welcome

✓ 278

Faster Baud Rate For the Superboard II Cassette

By James A. Antonelli

Being the owner of a Superboard II computer has its drawbacks. The hardware and software people seem never to have heard of OSI, and magazine articles are few.

So when I wanted to speed up my program-loading time, I found that I had to do it myself.

Some of my programs are 8K long. At 300 baud, loading can take as long

as five minutes. I could have gone to disk but didn't have the money. So after studying the schematics in the user's manual, I came up with this idea.

The Circuit

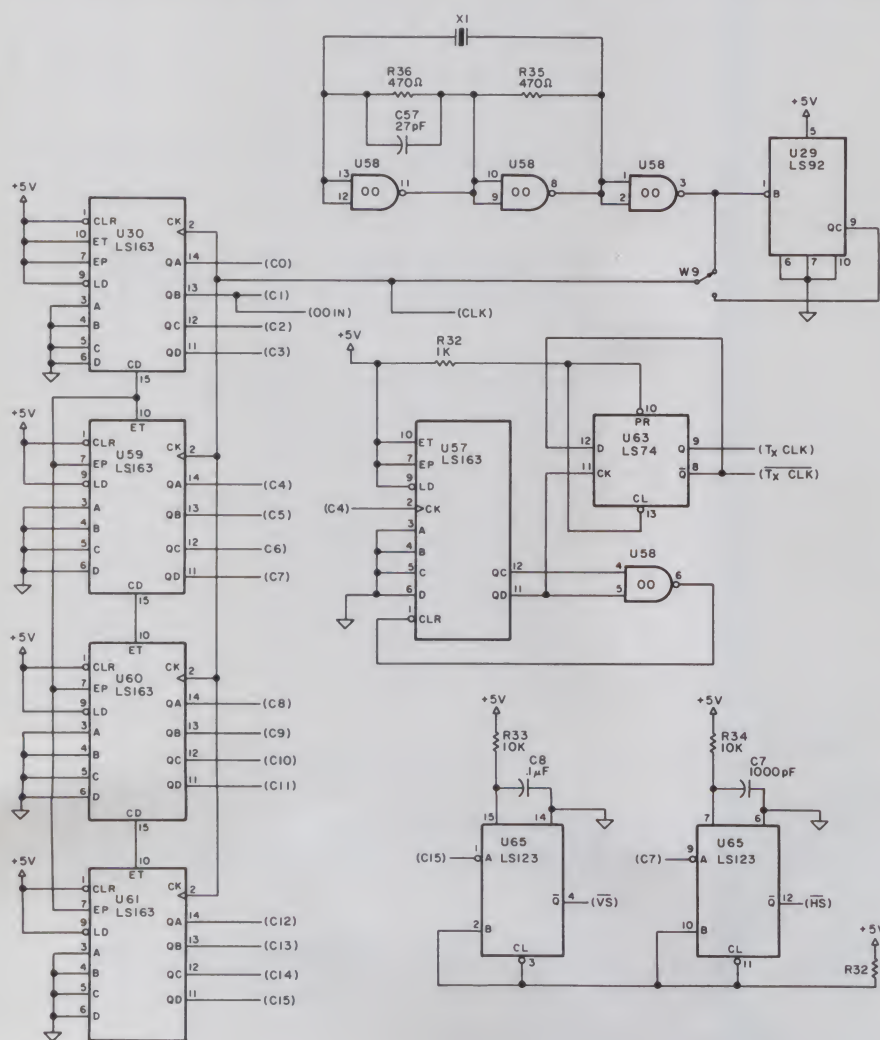
As can be seen in Fig. 1, the clock circuit U58 is divided into separate clock frequencies by U30, U59, U60 and U61. The chips we will be concerned with are U30, U57 and U59. Chip U57 receives clocking from U59, as can be seen in Fig. 1. Pin 2 of U57 connects to pin 14 of U59; this setup gives us the 300 baud rate.

First, to double the frequency or baud rate, cut the foil running to pin 2 near U57. Exercise care when cutting, to avoid damaging other traces.

When this foil is cut and all material is removed from the 600 board, you are then ready to proceed to the next step. You will need shielded cable, wire cutters and a small soldering iron (see parts list). If you also want to keep the 300 baud rate, then skip step 2 and go on to step 3.

Second, for a 600 baud rate only, you need to install a jumper wire from U30, pin 11, to U57, pin 2. You will also have to remove R53 and install a jumper here. It is advisable to ground the shielded cable at the nearest ground. Pins 3, 4, 5 and 6 of U57 are all grounded so you can ground the cable here. You can ground each end of the cable if you wish. I only grounded one end and haven't run into any problems yet.

After you have completed steps 1 and 2, skip to the alignment section,



step 4.

Step 3 requires a little more work, but you will have a choice between 300 and 600 baud. You will have to determine where you want to mount SW1. I mounted mine in the front, above the keyboard. Then measure the single conductor shielded cable from here to U57, leaving a few extra inches. Cut and strip insulation and tin ends. Solder this to the center position of SW1.

Now measure your second wire. Cut and strip insulation and tin ends. This one goes to U30. You can now solder this wire to the switch also, either to the top or to the bottom (see Fig. 2).

Now measure your last wire. This one goes to U59. Cut and strip insulation and tin ends. It is a good idea to tape all of the wires together. It makes a neater project, and servicing is easier.

One other note: make sure you identify the wires. Either mark them with a colored tape, wire numbers or any other method that will make them easy to identify. Solder this wire in the remaining lug on the switch, which should now only have three lugs left. These should all be on the opposite side. If not, go back to the beginning of step 3. It is a good idea to now go over your solder joints.

Cut two pieces of solid wire about six inches long. Strip about one inch of insulation. Wrap one of these wires around SW1, the bottom lug. The opposite end of this wire goes to the end lug of R1. With the wire remaining, twist this and the other wire from the two-conductor cable to the center lug of SW1 and the end lug of R1. This completes the switch.

The next step is to locate and remove R53 on the board (see Fig. 3). It is located near U69, pin 7.

The only wire left is the two-conductor shielded cable. Solder one of these wires, after cleaning the holes from the resistor R53. Don't forget to solder the top and bottom of the board. These are plated-through holes, but sometimes the plate is damaged when removing parts. The wire remaining can now be soldered in place.

This completes the board. Check for solder bridges and/or bad solder joints. If everything is OK, then lay the switch on the side and cut one

more piece of solid wire to about six inches in length. Strip all but three inches of insulation.

On the edge of the 600 board there should be a ground, and a few holes through this ground strip. If your particular board doesn't have these holes, you'll need to drill two holes here. Now insert the solid wire from the top, and after bending the wire bring this wire back up through the remaining hole. This will be used for holding the wires that were soldered previously. Route all wires to this point and, with the remaining solid wire, wrap this. This will keep the wires from being pulled off the foil. Your finished product should look quite professional.

The Alignment

Fourth, set the switch on nonconductive material. Turn your computer on; you should see the LED light up. If not, shut it off and recheck. If you have a frequency counter, alignment will be easy. If not, then enter the following simple program:

```
10 For I=0 to 32: For A=0 to 24: print "A";
next A: next I.
```

Now type in the command word SAVE, and run. Depending on the position of SW1, it will print letters A at the regular speed of 300 baud, or they will be printed at 600 baud.

As this program is being run, switch SW1 back and forth. There should be a difference in speed at which the As are being printed. Once you know which position is 300 baud

(it should be in the up position), mark it. It doesn't really make any difference where the 300 or the 600 baud is, just so you will know.

Get a blank tape and make a change in the program to:

```
10 For I=0 to 100: For A=0 to 24: print "A";
NEXT A: NEXT I
```

This should give enough recording time. Set SW1 to 600 baud, start the tape recorder and let the program run until it is completed. Flip SW1 to 300 baud and start the tape recorder. Let the program run until it is also completed.

You should now have two recordings, one at 600 baud and one at 300 baud. Rewind the tape and type in NEW, and enter this program:

```
10 Load: INPUT A$: GOTO 10.
```

One resistor, R57, has to be located on the 600 board. On my particular board, it is the blue one located near the rear of the board. Once you have located this resistor, enter RUN on the computer and start the tape recorder. Slowly turn until you start getting As printed on your monitor.

Once you get a consistent load (none of the As are being dropped out and you haven't received a syntax error message), leave R57 alone. Repeat the above load program a few times to be sure of the 600 baud rate. When you believe everything is OK, then let the tape advance to the second recording and set SW1 to 300 baud rate. Once again type in RUN. You will now have to adjust R1 until

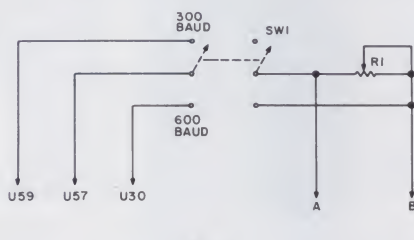


Fig. 2.

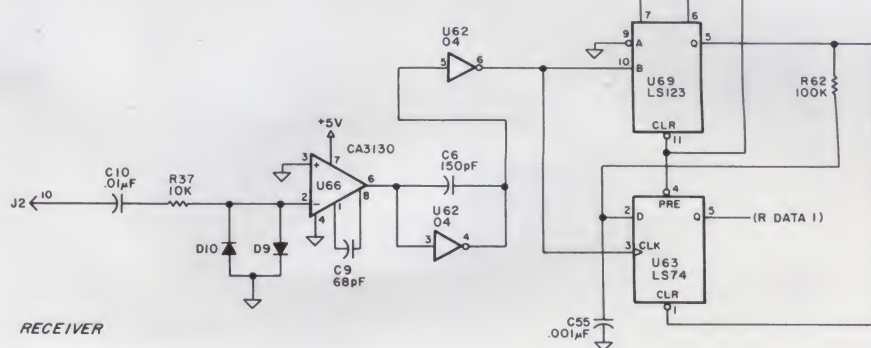


Fig. 3



Progressive Computing

HARDWARE: C1P VIDEO MOD. MAKES YOUR 600 VIDEO EVERY BIT AS GOOD AS THE 4P AND 8P. GIVES 3264 CHR LINE WITH GUARDBANDS 1 AND 2 MHz. CPU CLOCK WITH 300, 600 & 1200 BAUD FOR SERIAL PORT.

COMPLETE PLANS \$19.95

KIT (HARDWARE & SOFTWARE) \$39.95
INSTALLED 32 CHR—\$79.95 64 CHR—\$99.95

EXTRA K OF VIDEO RAM FOR 64 CHR NOT INCLUDED! C1P SOUND EFFECTS BOARD. COMPLETELY PROGRAMMABLE! FOR THE DISCRIMINATING HOBBYIST. THE BEST BOARD ON THE MARKET FOR CREATING SOUND AND MUSIC. CAN BE INTERRUPT DRIVEN SO THAT YOU CAN USE IT FOR GAMING PURPOSES. HAS ON BOARD AUDIO AMP 16 BIT INTERVAL TIMER, 128 BYTES OF RAM AND TWO 8 BIT PARALLEL I/O PORTS. ASSEMBLED AND TESTED \$99.95 FOR C1S AND \$124.95 FOR 540 VIDEO.

BARE BOARD \$39.95. BOTH INCLUDE PROG. MANUAL AND SAMPLE SOFTWARE.

C1P HI-SPEED CASSETTE KIT. GIVES A RELIABLE 300, 600 & 1200 BAUD. NO SYMMETRY ADJUSTMENTS—THE IDEAL FIX FOR OS's CASSETTE INTERFACE. EASILY IMPLEMENTED IN 30 MIN.—WILL SAVE YOU TIME AND MONEY EVEN THE FIRST NIGHT YOU USE IT! \$12.95.

PROGRAMMABLE CHARACTER GENERATOR BOARD \$99.95. YOU CAN USE OS's CHARACTERS OR YOU CAN MAKE YOUR OWN. IMAGINE YOU CAN NOW DO TRUE HIGH RESOLUTION GRAPHICS. 512 x 256 INDIVIDUAL DOTS IN THE 64 x 32 SCREEN FORMAT AND ALL UNDER YOUR CONTROL. OTHER MODES AVAILABLE—SEND FOR CATALOG SOFTWARE (WITH DOCUMENTATION).

PC CHESS V1.9 \$14.95

PALY CHESS AGAINST YOUR COMPUTER

HELICOPTER PILOT (64 CHR VIDEO ONLY) \$8.95

AN EXCELLENT GRAPHICS PROGRAM

GOLF CHALLENGER \$14.95

FROM 1 TO 4 PLAYERS. PALY A ROUND OF GOLF ON YOUR

18 HOLE GOLF COURSE. ONE OF THE BEST PROGRAMS I

HAVE EVER SEEN! YOU CAN EVEN DESIGN YOUR OWN

COURSE. COMES WITH FULL DOCUMENTATION (14 PAGES)

TWO VERY INTRICATE SIMULATIONS!

WILD WEASEL II. YOU OPERATE A SAM MISSILE BASE DURING A NUCLEAR WAR. NOT AS EASY AS YOU THINK! YOU

MUST OPERATE IN A THREE DIMENSIONAL ENVIRONMENT.

FAILSAFE II. THE SHOE IS ON THE OTHER FOOT! HERE YOU

ARE IN THE ATTACKING BOMBER AND YOU MUST PENETRATE

DEEP INTO ENEMY TERRITORY. CAN YOU SURVIVE?

AN EXTREMELY COMPLEX ELECTRONIC WARFARE SIMULATION! SPECIAL—BOTH FOR \$19.95.

MANY MANY MORE—SEND FOR CATALOG WITH

FREE PROGRAM (HARD COPY) AND BASIC MEMORY

MAP. \$1.00. TWO LOCATIONS TO SERVE YOU:

3336 AVONDALE CRT., WINDSOR, ONT., CANADA

N9E 1X6 (519) 969-2500

3281 COUNTRYSIDE CIR., PONTIAC TWP., MI 48057

(313) 373-0468



NEW EDUCATIONAL PROGRAMS for the TRS-80*

You can now order reading programs for
READING COMPREHENSION • ECONOMICS •
PHYSICS • MATH • AUTO • MECHANICS • HISTORY

2 FULL LENGTH PROGRAMS only \$9.90

(one cassette)

16 PROGRAM COURSE only \$77.00 (8 cassettes)

Order by checking the desired programs:

- | | |
|--------------------------------------|---|
| *Reading | <input type="checkbox"/> Physics 1 \$9.90 |
| Comprehension | <input type="checkbox"/> Physics 2 \$9.90 |
| <input type="checkbox"/> Cd 1 \$9.90 | <input type="checkbox"/> Economics 1 \$9.90 |
| <input type="checkbox"/> Cd 2 \$9.90 | <input type="checkbox"/> Economics 2 \$9.90 |
| <input type="checkbox"/> Cd 3 \$9.90 | <input type="checkbox"/> History 9 \$9.90 |
| <input type="checkbox"/> Cd 4 \$9.90 | <input type="checkbox"/> History 10 \$9.90 |
| *12 more Cd's available | |
| *Auto | <input type="checkbox"/> 2 Demo programs \$9.90 |
| Mechanics | and Catalogue |
| <input type="checkbox"/> Ka 1 \$9.90 | Utilize with any Model I, Level I or |
| <input type="checkbox"/> Ka 2 \$9.90 | Level II, 4K and 16K or any Model III |
| <input type="checkbox"/> Ka 3 \$9.90 | Displays lower case if you have it |
| <input type="checkbox"/> Ka 4 \$9.90 | |
| *12 more Ka's available | |

*TRS-80 IS A TM OF TANDY CORP.

I have enclosed a total of _____ \$9.90
for each 2 program cassette ordered plus \$.50
per cassette for shipping/handling to:

DORSETT 155
Educational Systems, Inc.

P.O. Box 1226, Norman, Ok. 73070

Name _____
Address _____
City _____ State _____ Zip _____

you get a consistent loading of As. Redo until you think everything is OK. Flip SW1 to 600 baud and try this position again. Sometimes you'll need to make very small adjustments to R57, but remember: any adjustment to this resistor also means an adjustment to R1. If everything is OK, then mount SW1 and enjoy rerecording your programs at double the speed.

I made this conversion nearly a year ago, and I haven't had to make any adjustments whatsoever. I highly recommend using a quality tape for the 600 baud rate. Using cheap tape may result in drop-outs; you then have to reload with your back-up tape (300 baud) and have gained nothing! ■

Parts List

Two-conductor shielded cable
Single-conductor shielded cable
10k mini trimpot
2PDT mini switch
Stranded hook up wire
Solid hook up wire
Small soldering iron, solder, etc.

Why Do Professionals Prefer

BECAUSE

- Unique software • Technical support • Quick delivery • Established company • Release 2 CP/M (some packages under UNIX* and TRSDOS*)
- Quality software • In-house expertise • Fast response • User orientation • Competitive prices
- Customer service • Verbatim® media • Onyx hardware (CP/M and UNIX versions)



BECAUSE

Unique swift routing Cybernetics response system gives you no-nonsense technical answers that save you time. Call: (714) 848-1922.



Business
Medical
Real Estate
Computer Systems

Software from Cybernetics?

RM/COBOL—The new standard for microcomputer COBOL! The only COBOL for CP/M (also on TRSDOS & UNIX) with alternate keys (multi-key ISAM), CRT screen handling, interactive debug, and the most useful Level 2 features. Compatible with RSCOBOL—but runs faster.

Plus existing CBASIC2 packages

- APH* (Automated Patient History)
- Osborne & Assoc.—Payroll • Payables/Receivables
- General Ledger
- NAD* (Name and Address)
- PMS (Property Management System)

Inquire for details

Trademarks of: *Ryan-McFarland Corp., *Compiler Systems, Inc., *Digital Research, *Bell Telephone Laboratories, Inc., *Tandy Corp., *Verbatim, Inc., *Cybernetics, Inc., *Structured Systems Group, Inc., *Small Business Applications, Inc.

And system software packages:

- MAGIC WAND® Editing/Word Processing
- CBASIC2 Compiler BASIC
- QSORT® Soft Merge Package

TRS-80®: Model II CP/M—The fastest Mod II CP/M with the most features. Outstanding teaching documentation for newcomers to CP/M, multiple CRT emulation, down loading package, support for CORVUS 10 Mb hard disk. Many additional user-oriented features.

- NEW RM/COBOL® applications:
• Order Entry/Inventory • Receivables • Payables • General Ledger • Financial Modeling • Client Accounting—and more on the way!
- NEW CBASIC2® applications:
• REAP (Real Estate Acquisition Programs).



Distributed in U.K. by
Microcomputer Applications Ltd
11, Riverside Court, Caversham, Reading, England
TEL (0734) 470425



8041 Newman Ave., Suite 208
Huntington Beach, CA 92647
(714) 848-1922

Digital Research Exclusive 4 DIGIT FLUORESCENT CLOCK MODULE

74177 BINARY COUNTER/LATCH

Divide by 2, 4, 8, 16

Presetable Input **\$.60**

PMD-11K-60

60 Volts. HFE 800-20K

12 Amps. PNP TO-3

150 Watts. By Lambda.

\$1.50

**BRAND
NEW!**

D to A CONVERTER

MC1408L6 **Each**

While They Last **\$4.95**

4K By 1

STATIC MEMORY

MK4104-4 **\$4.50 Ea.**

SWITCH

Same type as used on
some computer boards.

**\$.69 Each DPST or can
be arranged SPDT.**

5 For \$2.50



MICROWAVE DIODE

For Down Converters

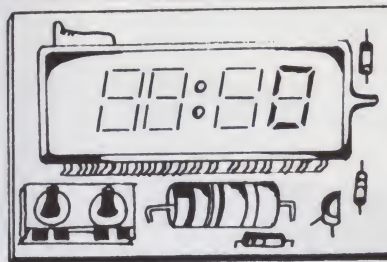
5082 - 2835 **\$1.50 or 5 For \$6.00**

SEND FOR FREE FALL CATALOG

Digital Research: Parts

(OF TEXAS)

P.O. BOX 401247C GARLAND, TEXAS 75040 • (214) 271-2461



A super fantastic car clock module, or desk
clock. Four bright, blue-green digits .33
inches tall and very pleasing to the eye.

FEATURES:

CMOS - 3MA Max. Current

Display can be dimmed

Display Off, but clock continues to count

Crystal controlled accuracy

Small physical size 2 1/2 x 2 x 5/8

On-Board hours and minute set switches

All you need to make this exceptional time
piece work is + 12VDC.

12 Hour Model - \$5.95 or 3/\$15.00

24 Hour Model - \$6.95 or 3/\$18.00

TERMS: Add 50¢ postage, we pay balance. Orders under \$15 add 75¢
handling. No C.O.D. We accept Visa, MasterCard and American Ex-
press cards. Tex. Res. add 5% Tax. Foreign orders (except Canada) add
20% P&H. 90 Day Money Back Guarantee on all items.

FEATURES INCLUDE:

- Uses Standard Typewriter Ribbon
- Micro Processor Controlled
- Can Operate Continuously—
No Thermal Problems (Has an all metal
print head)
- 5 x 7 to Larger 10 x 7 and Larger 10 x 14
Dot Matrix Character Generator
- Standard 96 ASCII Character Font
- Upper and Lower Case Printing
- Up to 88 Characters Per Line
- Single Line Print Rate Is 160 CPS
- Average Print Rate Is 60 CPS For Ten
Lines
- Graphics Capability With Extended
Character Modes
- Programmable With 32 System Level
Software Commands
- Standard Parallel and Serial Interface
- Software and Hardware Reset Interface
- Software Line Counting For Paging
- Baudrate Select From 110 to 9600
- Manual Paper Advance
- Manual Selftest and Reset
- Adjustable Tractor Width From 1 to 9 1/2
Inches
- Interfaces with Apple, Atari, OSI, T.I.,
TRS-80 and the List Goes On •

FACTORY DIRECT

✓ 271

COOSOL, INC.

P.O. BOX 743, ANAHEIM, CA 92805 (714) 545-2216 7 Days a Week

COOSOL DATA LOGGER IMPACT PRINTER



\$495 Kit, 101B-80KE

\$545 Assembled & Tested 101B-80E

*Registered Trademarks of Apple Computer Inc., Atari Inc., Ohio Scientific Inc., Texas Instruments Inc.,
Tandy Corp. respectively.

An Adventure In Free Enterprise

By Forest E. Myers

It started innocently enough. I had just finished a general program that could, among other things, generate mailing labels from a DATBAS file. My brother-in-law asked if I would be willing to do some labels for a friend. A week or two later, the friend called asking about prices. Needless to say, I was taken aback by the prospect of having a paying customer. Thus began my adventure in the mailing label business.

The program, which serves as the focus of this article, is called Labels, and is an extension of two previously-published programs: Screen (*Microcomputing*, April 1980) and Fileit (*Microcomputing*, May 1980). It lets you print more than one DATBAS record

across a page. This reduces the amount of paper used when dumping a data file. By making the program more general, selected items can be output from data base records. Presto, change-o, a mailing label generator.

A Market for Labels

If you've looked closely at your mail lately, you have seen the extent to which gummed labels are used. There are business firms that specialize in mailing list maintenance, update and envelope services. For large-volume users, these companies offer a very cost-effective method of relieving the burden associated with large mailings.

For small-volume users, however, these services are prohibitively expensive. The large services have a required minimum on the number of labels in a run. As a result, the small mailer must buy a several-months' supply of address labels to reach the minimum level. Invariably, addressees change over time and the labels become stale.

Therefore, the small mailer must hand-write address labels or use copy machine labels. The former takes an inordinate amount of time. The latter is difficult to update and hard to maintain in any prearranged sequence.

A niche, therefore, exists for the microcomputer owner. There is a market to be supplied, one that consists of real estate agents, manufacturers' representatives, churches, bowling leagues, small businesses and so on.

To tap this market requires a little hustling. Contact friends and tell them about your service. Visit local establishments and, if the budget will permit, take out occasional newspaper ads. Look for trade magazines whose readers could be potential customers. Many times the advertisement rates in these publications are low and give you wide exposure for little cost. Mailings are another tool for telling others of your entry into the mailing label business.

Address correspondence to Forest E. Myers, 5114 Garnett St., Shawnee, KS 66203.

Program listing.

```
10 FILL 12890,145 : REM LET BASIC PRINT OUT A 145 CHARACTER LINE
20 CLOSE (0,E) : CLOSE (1,E) : CLOSE (2,E) : CLOSE (3,E)
30 DIM A$(256),B$(10),C$(10),D$(256),E$(512),C(30),F(30)
40 DIM R(30),L(30),F$(256)
50 DIM G$(256),T$(256)
60 DIM R$(256),L1(30)
70 DIM D(30),N1(30)
80 DIM D1(30),T(30)
90 "" : REM CLEAR SCREEN AND HOME CURSOR
100 FOR I=1 TO 7 : "" : NEXT I
110 "" : LABEL PROGRAM""
120 A$="" : FOR I=1 TO 8 : A$=A$+A$ : NEXT I
130 D$=A$ : B$=A$(1,10) : C$=B$ : E$=A$+D$ : F$=A$
140 G$=A$ : T$=A$
150 R$=A$
160 R$=A$(1,1)
170 FOR I=1 TO 5 : "" : NEXT I
180 INPUT "Enter DATBAS file name ",B$
190 INPUT "Enter drive no. where DATBAS file can be found ",D1
200 B$=B$+"."+DA$+CHR$(0)
210 OPEN (2,E,B$,2,D1)
220 GET (2,E,A$,0)
230 C$=A$(241,242) : CONVERT C$ TO Z : REM NUMBER OF LABELS IN FILE
240 C$=A$(243,244) : CONVERT C$ TO L1 : REM STARTING CRT LINE
250 C$=A$(245,246) : CONVERT C$ TO B1 : REM BLOCKING FACTOR
260 C$=A$(247,249) : CONVERT C$ TO D : REM LENGTH OF RECORD
270 C$=A$(250,252) : CONVERT C$ TO Z3 : REM NUMBER OF RECORDS IN FILE
```

More →

However, before spending a lot of time, effort and money in this area, consider the likelihood that your envelope will be thrown in the trash before it is opened. My own experience tells me never to send letters to real estate agents. They are bombarded with every type of sales pitch. Letters stand little chance of spurring interest. A visit to the office may produce more results. Be careful, though. Your visits may be viewed as business soliciting, and you may run afoul of local laws prohibiting soliciting without a license. Check with city officials before you make your calls.

Finally, before you visit, work up a small sales pitch and practice it on an unsuspecting friend, wife or family pet so you don't waste your potential customers' time. Also, work up a small reminder card or sales poster so if they want to use your service in the future, they will know where to reach you.

Pricing the Service

Having tackled the problem of contacting potential customers, how do you price your service? Depending upon the extent of your services, you can levy charges in several areas. The first is a data entry charge, which is for entering the name and address information into your microcomputer and storing it for future use. My advice is to set your price to cover wear and tear on your machine and the time you spend entering data. For instance, I charge 5 cents a label for data entry.

With DATBAS and a list of addresses where street name, city, state and ZIP code change infrequently (addressee and street number change each time), Karen, my cohort, can average 100 labels an hour (\$5 an hour). This fee is well below that charged by larger firms, which may run as much as 16 cents per label. You can charge less, since your overhead is much lower than theirs.

Next, you can charge for updates, corrections and even sorting the address file to customer specification. For corrections and update, I charge the data entry fee. I do sorts for free. However, since my typical customer doesn't use bulk mail, I've had few requests to sort address files into any particular order. Deletions from the address file are done for free. This encourages clients to purge their files of outdated and unneeded records.

The label charge, for the labels themselves, is where the money is

Program continued.

```

280 C=A*(253,256) : CONVERT C% TO R : REM MAX RECORDS FILE CAN HOLD
290 W=Z
300 FOR I=1 TO Z
310 C=A*(I*2-1,I*2) : CONVERT C% TO L(I) : REM LENGTH OF INDIVIDUAL SCREEN LABELS
320 C=A*(I*2,I*2) : CONVERT C% TO D(I) : REM LENGTH OF INDIVIDUAL DATA FIELDS
330 NEXT I
340 FOR I=1 TO 2
350 GET (2,E,A#,I)
360 E*(I*256-255,I*256)=A# : REM BRING IN LABEL TEXT
370 NEXT I
380 GET (2,E,A#,3)
390 FOR I=1 TO Z
400 C=A*(I*2-1,I*2) : CONVERT C% TO R(I) : REM CRT ROW ADDRESS FOR SCREEN LABEL
410 C=A*(I*2,I*2) : CONVERT C% TO C(I) : REM CRT COLUMN ADDRESS FOR SCREEN LABEL
420 NEXT I
430 FOR I=1 TO Z : N1(I)=D(I) : NEXT I
440 S1=1
450 GOSUB 2100
460 C1=0
470 D3=0
480 CURSOR 15,0
490 "Enter label line, position for data field (1,p) ";
500 FOR I1=1 TO Z
510 CURSOR R(I1),C(I1)+L(I1) : REM POSITION CURSOR BEHIND CRT LABEL
520 INPUT D$
530 " " : REM BLANK OUT LEFTOVER CURSOR PROMPT
540 Z2=D(I1)-LEN(D$) : FOR Q7=1 TO Z2 : " " : NEXT Q7
550 D3=D3+D(I1)
560 CURSOR R(I1),C(I1)+L(I1)
570 " "
580 IF D$="99,99" THEN EXIT 760
590 IF LEN(D$)=0 THEN 750
600 C1=C1+1
610 B$=D$
620 FOR I=1 TO LEN(D$)
630 IF B$(I,I)=", " THEN EXIT 650 : REM FIND ", " SEPARATING ADDRESS LABEL LINE AND LINE POSITION
640 NEXT I
650 C=B$(1,I-1)
660 CONVERT C% TO L1(C1) : REM SAVE ADDRESS LABEL LINE ADDRESS
670 D1(C1)=I1 : REM SAVE THE SCREEN LABEL NUMBER
680 X=LEN(D$) : REM FIND LENGTH OF USER INPUT
690 C=B$(I+1,X) : REM CONVERT INFO AFTER ", " TO NUMERIC DATA FOR RELATIVE LINE POSITION
700 CONVERT C% TO T
710 T=T+.01
720 L1(C1)=L1(C1)+T : REM ADD ADDRESS LINE AND RELATIVE LINE POSITION TOGETHER
730 D(C1)=D(I1) : REM STORE DATA FIELD LENGTH ASSOCIATED WITH USER SELECTED SCREEN LABEL
740 D4(C1)=D3
750 NEXT I1
760 Z=C1 : F0=0
770 FOR I=1 TO C1 : F0=F0+D(I) : NEXT I
780 REM F0 TOTAL LENGTH OF FIELDS SELECTED
790 REM SORT THE USER INPUT INTO ORDER SO THAT ADDRESS LABELS WILL COME OUT AS SPECIFIED.
800 FOR I=1 TO Z-1
810 FOR J=I+1 TO Z
820 IF L1(I)<L1(J) THEN 920
830 T=L1(I) : L1(I)=L1(J) : L1(J)=T
840 T=D(I) : D(I)=D(J) : D(J)=T
850 T=D4(I) : D4(I)=D4(J) : D4(J)=T
860 L1(I)=L1(J) : D1(I)=D1(J)
870 D(I)=D(J)
880 D4(I)=D4(J)
890 L1(J)=T : D1(J)=T1
900 D(J)=T2
910 D4(J)=T3
920 NEXT J
930 NEXT I
940 REM CALCULATE THE BEGINNING AND ENDING POSITION FOR EACH LINE IN ADDRESS LABEL
950 REM CALCULATE THE NUMBER OF LINES IN THE LABEL -- 10 MAX
960 REM D5 BEGINNING POSITION OF ADDRESS LABEL LINE
970 REM D6 ENDING POSITION OF ADDRESS LABEL LINE
980 REM Y9 KEEP TRACK OF NUMBER ADDRESS LABEL LINES
990 REM C2 NUMBER OF LINES IN ADDRESS LABEL
1000 D5=1 : D6=0 : Y9=1
1010 FOR I=1 TO Z
1020 D6=D6+D(I)
1030 IF INT(L1(I))>INT(L1(I+1)) THEN 1050
1040 GOTO 1070
1050 D5(Y9)=D5 : D5=D6+1
1060 D6(Y9)=D6 : Y9=Y9+1
1070 NEXT I
1080 C2=1
1090 FOR I=2 TO Z
1100 IF INT(L1(I-1))>INT(L1(I)) THEN C2=C2+1
1110 NEXT I
1120 " "
1130 INPUT "Selection criteria to be used (Y/N) ",C#
1140 IF C#="Y" OR C#="y" THEN S9=1 : GOSUB 1830
1150 " "
1160 INPUT "Enter number of labels per line ",L8
1170 INPUT "Enter number of lines between labels ",L6
1180 FOR I=1 TO L8
1190 "For label";X3I;I;" "
1200 INPUT "enter printer column label is to begin ",T(I)
1210 NEXT I
1220 L5=1
1230 INPUT "Enter beginning record for label output ",B0
1240 "There are";Z5I;Z3;" records currently in the file"
1250 INPUT "Enter ending record for label output ",E0
1260 E1=INT(B0/B1) : E2=B0-E1*B1 : IF E2>0 THEN E1=E1+1
1270 E1=E1+4 : REM BEGINNING DISK BLOCK TO BE READ FOR OUTPUT
1280 IF E2=0 THEN E2=B1
1290 E3=INT(E0/B1) : E4=E0-E3*B1 : IF E4>0 THEN E3=E3+1

```

More

Program continued.

```

1300 E3=E3+5 : Z0=B0 : REM ENDING DISK BLOCK TO BE READ FOR OUTPUT
1310 E5=G5+F5
1320 FOR I=E1 TO E3
1330   GET (2,E,A5,I)
1340   FOR J=E2 TO B1
1350     IF Z0=E0+1 THEN 1490
1360     D9=1 : D4=0
1370     IF S9=0 THEN 1490
1380     IF S7=1 THEN 1450
1390     D5=F5
1400     FOR W=1 TO S8
1410       D5(D2(W)-D3(W)+1,D2(W))=A5(J*D-D+D2(W)-D3(W)+1,J*D-D+D2(W))
1420     NEXT W
1430     IF G5=D5 THEN 1530
1440     GOTO 1620
1450     FOR W=1 TO S8
1460       IF G5(D2(W)-D3(W)+1,D2(W))=A5(J*D-D+D2(W)-D3(W)+1,J*D-D+D2(W)) THEN EXIT 1490
1470     NEXT W
1480     GOTO 1620
1490     IF Z0=E0+1 THEN L8=L5-1 : GOSUB 1690 : EXIT 1660
1500     D1=0
1510     REM THE CODE TO FOLLOW BUILDS ONE ADDRESS LINE FOR ALL LABELS ACROSS THE LABEL CARRIER
1520     REM WHEN L5 INDICATES WHEN LINE IS BUILT FOR ALL LABELS DUMP THE LINE TO THE PRINTER
1530     FOR I1=1 TO Z : REM NOTE Z NOW HOLDS THE NUMBER DATA FIELDS COMPRISING THE ADDRESS LABEL
1540       D1=D4(I1)
1550       D2=D1-D(I1)+1
1560       D4=D4-D(I1)
1570       E5(L5*F0-F0+D9,L5*F0-F0+D4)=A5(J*D-D+D2,J*D-D+D1)
1580       D9=D4+1
1590       NEXT I1
1600       L5=L5+1
1610       IF L5=L8+1 THEN L5=1 : GOSUB 1690
1620       Z0=Z0+1 : REM NUMBER OF LABELS OUTPUT
1630       NEXT J
1640     E2=1
1650     NEXT I
1660     CLOSE (2,E)
1670     W"End of processing"
1680     END
1690     REM PRINT LABELS
1700     OPEN (PRINTER,E)
1710     D1=0
1720     S1=0
1730     I2=1
1740     FOR I1=1 TO C2 : REM C2 HOLDS NUMBER OF ADDRESS LABEL LINES
1750       W" "
1760       FOR I3=1 TO L8 : REM L8 HOLDS NUMBER OF LABELS ACROSS LABEL CARRIER
1770         WTAB(T(I3));E5(I3*F0-F0+D5(I1),I3*F0-F0+D6(I1));
1780       NEXT I3
1790       NEXT I1
1800       FOR L9=1 TO L6 : W" " : NEXT L9
1810       CLOSE (PRINTER,E)
1820       RETURN
1830       REM SELECTION CRITERIA ROUTINE
1840       W""
1850       W" Note: Up to 3 data fields can be used to limit records output"
1860       W" "
1870       INPUT "Enter number of selection criteria ",S8
1880       IF S8<1 OR S8>3 THEN S9=0 : RETURN
1890       INPUT "Must all selection criteria be met (Y/N) ",C5
1900       IF C5="N" OR C5="n" THEN S7=1
1910       GOSUB 460
1920       CURSOR 15,0
1930       W"Enter selection criteria at '?' above ";
1940       S6=1 : D1=0 : D7=0
1950       FOR I=1 TO W9
1960         CURSOR R(I),C(I)+L(I)
1970         INPUT D5
1980         Z2=N1(I)-LEN(D5) : FOR I2=1 TO Z2 : W" " : NEXT I2
1990         D1=D1+N1(I)
2000         W" ";
2010         CURSOR R(I),C(I)+L(I) : W" ";
2020         IF LEN(D5)=0 THEN 2070
2030         D3(S6)=N1(I) : D2(S6)=D1 : D6=N1(I)-1
2040         G5(D1-D6,D1)=D5
2050         S6=S6+1
2060         IF S6=S8+1 THEN EXIT 2090
2070         NEXT I
2080         IF S6<S8+1 THEN U9=1 : GOTO 1830
2090         RETURN
2100       REM SCREEN PRINT ROUTINE
2110       W"" : REM THIS WILL CLEAR SCREEN AND HOME CURSOR
2120       D1=0
2130       J1=1
2140       FOR I1=1 TO W9
2150         CURSOR R(I1),C(I1)
2160         K1=J1+L(I1)-1
2170         W5(J1,K1);
2180         W" ";
2190         J1=K1+1
2200         D1=D1+N1(I1)
2210         IF S1=1 THEN 2270
2220         FOR M1=1 TO N1(I1)
2230           W"x";
2240         NEXT M1
2250         GOTO 2270
2260         W5(J*D-D+(D1-(D(I1)-1)),J*D-D+D1);
2270       NEXT I1
2280       S1=0
2290       RETURN

```

made. I charge 3 cents per label. One firm I know charges 2.7 cents per label per thousand. If you buy your labels in large quantities, your label cost will be around .02 cents per label. Once label data is entered, you incur only label costs—the rest is gravy.

If you really become involved in the mailing business, you can offer envelope services. This entails collating and folding materials to be mailed, stuffing envelopes, affixing postage and actually mailing materials.

Finally, there is a delivery charge for getting the finished product to your customer. To remain competitive, about the only thing you can do here is recover out-of-pocket costs.

The Program

The DATBAS programs mentioned earlier make Labels a relatively small program. They relieve the Labels program from file creation and update operations. Labels' only function is to output selected portions of DATBAS files to labels.

Labels first requests the name and drive location of the file requested. Next, a data entry screen is presented, and the program asks you to enter the line and position on the line of each data field to be included in the output label. (If the data field is not to be output, you input a RETURN or ENTER.) A prompting "?" will move through the CRT display until all data fields in the file are exhausted.

Next, you are asked if selection criteria to limit output are to be specified. If so, you enter "Y." You can specify up to three criteria. As with the data specification process phase described previously, you are presented with a CRT display of the data fields in the file. You enter the selection criteria in response to the prompting "?". If a particular data field is not to serve as a selection criterion, you input a RETURN or ENTER. When you have input the previously specified number of criteria, a request is made if "all" or "any one" criterion needs to be met by the record for its output to labels.

Next, you make a request to specify the number of labels across the page or label carrier, the number of print lines between labels and the beginning print position for each label on the carrier. The latter process is similar to setting the tabs on a typewriter. With the entry of this information, you are asked to specify the range of

records in the data file to be read for possible label output. Labels are then output to the system printer.

The flexibility of Labels is shown in Listing 1. One, two, three and four labels across are presented. Of particular interest is the way data field orders can be varied among the label sets.

The program listing for Labels is included. Variable descriptions and remark statements have been included to aid those who might want to use Labels for their own purposes. ■

FOREST E. MYERS
5114 GARNETT ST
SHAWNEE, KS. 66203

FOREST E. MYERS
5114 GARNETT ST
SHAWNEE, KS. 66203

FOREST E. MYERS
5114 GARNETT ST
SHAWNEE, KS. 66203

FOREST E. MYERS
5114 GARNETT ST
SHAWNEE, KS. 66203

CIPHER COMPUTER CO.
PO BOX 3508
SHAWNEE, KS. 66203

CIPHER COMPUTER CO.
PO BOX 3508
SHAWNEE, KS. 66203

CIPHER COMPUTER CO.
PO BOX 3508
SHAWNEE, KS. 66203

RW SALES
PO BOX XXXX
KANSAS CITY, MO 64119

RW SALES
PO BOX XXXX
KANSAS CITY, MO 64119

WILCOX PROPERTIES
132 BIG BUCKS AVE.
BELTON, MO. 64111

Listing 1.

APPLE* PRODUCTS

SOFTWARE

APPLE COMPUTER

	Our Price	
Apple II Plus 16K	1330.00	1169.00
Apple II Plus 48K	1530.00	1249.00
Apple II Disk w/cont 3.3	645.00	549.00
Apple II Disk w/o cont	495.00	469.00
Apple Pascal System	495.00	399.00
Apple Silentype Printer	595.00	529.00
Integer Firmware Card	200.00	179.00
High Speed Serial Card	195.00	169.00
Centronics Parallel Card	225.00	189.00

PRINTERS/MONITORS ACCESSORIES

Microsoft Z-80 Softcard	349.00	299.00
Hayes Micromodem II	379.00	349.00
CCS-7710A Serial Card	159.95	129.00
CCS-7728A Centronics Card	119.95	99.00
CCS-7424A Clock/Calendar	125.00	99.00
Mntn Comp A/D-D/A Card	350.00	329.00
Mntn Comp ROM Plus Card	155.00	139.00
Mntn Comp Filter ROM	55.00	49.00
Mntn Comp Copy ROM	55.00	49.00
M&R Supermod II	29.95	29.00
Smartterm 80 Col Board	360.00	329.00
Sanyo 9 in Monitor	240.00	179.00
Sanyo 12 in Monitor	320.00	289.00
OKI u80 Printer	800.00	595.00
Paper Tiger 460G Printer	1395.00	1249.00

Retail Store Prices May Differ From
Mail Order Prices

Visicalc	150.00	129.00
Desktop Plan	99.50	84.00
CCA Data Management	99.50	84.00
Applewriter	75.00	65.00
Appleplot	70.00	59.00
Apple Fortran	200.00	179.00
Apple Cashier	250.00	219.00
Apple Controller	625.00	549.00
Magic Window Text Editor	99.95	84.00
BPI Gen Ledger	495.00	350.00
BPI Accounts Receivable	495.00	350.00
BPI Inventory	495.00	350.00
The Data Factory	150.00	129.00
DB Master	189.00	149.00
Paper Tiger 460G Graphics	45.00	39.00
Memorex 5 1/4" Diskettes		
W/Hub Ring Box 10	39.95	29.00

*Apple II is a trademark of Apple Computer, Inc.
*Hayes Micromodem II is a trademark of Hayes
Microcomputer Products, Inc.

OLENSKY BROS., INC. ✓ 130

COMPUTER SALES DIVISION

3763 AIRPORT BLVD. • MOBILE, AL. 36608

205/344-7448

10 AM-6 PM CST



16K MEMORY KITS TMS-4116²⁵⁰_{N.S.}

"WE WILL NOT BE UNDERSOLD"

IF YOU CAN FIND A BETTER PRICE IN THIS
MAGAZINE CALL AND WE WILL MATCH OR
BETTER IT.

12 MONTH GUARANTEE

\$32.00 PER SET
OF 8 CHIPS

ADD \$2.00 SHIPPING & HANDLING
PER ORDER

PAYMENT: MASTER CHARGE, VISA
CASH, MONEY ORDER,
U.P.S., C.O.D.,
PERSONAL CHECKS
REQUIRE 2-3 WKS.
TO CLEAR BANK.

Computer
Services ✓ 80

30 Hwy. 321, N.W.
P. O. Box 2292
Hickory, N. C. 28601
(704) 294-1616

PHONE HOURS:

6 P.M. — 9 P.M. EST

DIABLO 1620 \$1895



- Letter quality daisywheel printer
- Upper and lower case
- Forms tractor, print wheel, ribbon included
- ASCII serial interface with RS-232 cable
- Bidirectional printing
- Completely refurbished by national terminal distributor with 30 day warranty

PRINTERS

NEC 5510	\$2495
NEC 5530	2495
Diablo 630	2425
Centronics 730	675
Centronics 737	799

VIDEO MONITORS

9" Sanyo B&W	\$169
12" Sanyo B&W	289
12" Sanyo w/green screen	299
13" Sanyo Color	495
9" Panasonic B&W	169
9" RCA B&W	169

DISKETTES

Verbatim		3M	
5" SS, DD	10/2 49	5" SS, SD	10/2 99
5" DS, DD	10/4 59	8" SS, SD	10/3 05
5" SS, QD	10/3 75	8" SS, DD	10/4 13
8" SS, SD	10/4 43	8" DS, SD	10/5 25
8" SS, DD	10/4 95	8" DS, DD	10/5 25
8" DS, DD	10/5 33		
Diskette Storage Pages.	10/4 25	Disk Library Case	5" 2.95 8" 3.95

3M HEAD CLEANING KIT

- Eliminate downtime
- Eliminate service calls
- Increase life of read-write heads
- Cleans in 30 seconds
- Removes dust, dirt, magnetic oxides



\$19.50

PAPER & LABELS

Greenbar 14 1/2 x 11	
one part	39.95
two part	45.95
White 9 1/2 x 11	
one part	29.95
two part	33.95
Labels 3 1/2 x 1 1/8	
one across	17.30
two across	34.60

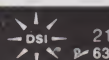
PRINT WHEELS

Mfr.	ea.	6+
Diablo	8.25	7.50
Qume	8.25	7.50
NEC	17.00	15.50

RIBBONS

Mfr.	ea.	6+
Diablo	6.50	72.00
Qume	4.00	43.50
NEC	7.00	71.50

Call for quantity prices—Dealer inquiries invited



DAVIS SYSTEMS INC.
2184 Meadowcliff Drive N.E., Atlanta, GA. 30345
(404) 634-2300



Microcomputer Selection And Implementation

By Bruce T. Pace

In our work as consultants, we've helped many small-businessmen and professionals travel the road to microcomputer system selection and implementation. These are people who, although lacking technical backgrounds, recognize the microcomputer potential, but are unprepared for the onslaught of technical specifications, buzzwords and the variety of products and vendors.

The need for vendor-independent consulting has naturally arisen from a marketplace which lacks true standardization and occasionally masks incompetence with mystique. The intent of this article is to remove the computer mystique and present guidelines to more clearly define the computer selection process.

A Question of Definition

A problem immediately arises when defining a computer system. For some, a given configuration of hardware constitutes a computer system. For many, it is the integration of hardware and software. But those in business who have purchased hardware, software and two days of training will often disagree.

To be used effectively as a tool, the computer system must provide for all aspects of its use. It must produce better than the previous business procedures. To meet the expectations of business, the definition of a computer system should include:

- Hardware
- Software

- Maintenance
- Training
- Documentation
- Human engineering
- Contingency planning

Maintenance

The functional system entails much more than hardware and software. Without dependable maintenance, an entire office can come to a devastating standstill. Consideration must be given to repair turnaround time, inventory of a vendor's in-house parts and technical competence.

Although costs are sometimes slightly higher, purchasing the basic software and hardware package from a local source often results in preferred customer status on maintenance and ordering. For the business that is highly dependent upon its computer processing, a maintenance contract is advisable. You may arrange to buy a kit of crucial components for backup.

Training

Since maintenance is critical to continued processing, training is crucial to efficient computer use. Regardless of its potential, the computer will not improve business processing if the staff isn't well-trained. Part of the training should be conducted at the user's site to ease the adjustment to different methods and terminology. The better the training, the less employees will resist change. If your vendor has instruction available, it is advisable to supplement on-the-job training with such a course. This

helps counter any problems that may result from word-of-mouth training.

Documentation

Documentation is probably the least-liked and most ignored aspect of computer processing. But without adequate documentation, a computer system can become partly or fully obsolete long before its normal life expectancy.

For most changes you make to your system in the future, you will need the manuals provided by the hardware and software vendors. And if someone alters your system, hang on to that invoice until you are sure the change is clearly documented. If he moves and no one is sure what was done, you may have to go back to square one.

Business procedures established for computer processing must be well-documented. It serves as a ready reference for personnel, provides for problems and reruns and greatly facilitates personnel training. Thorough, current documentation of daily operations and procedures eliminates the problem of any personnel leaving with all of your established procedures in his head.

Human Engineering

The new computer normally involves a change in the methods people establish to perform their tasks. The system should be matched to its environment. The result is increased efficiency and decreased human resistance. The staff should always take part in configuring a system because, simply, they have to live with it. De-

Bruce T. Pace is the president of Microsense Corporation, 7916 Grow Lane, Houston, TX 77040.

termine the best method for disk use and filing. Consider the keyboard height, ribbon changing, disk care and so on.

Contingency Planning

When a complete system is in place, it's time to consider the "what if" possibilities. What if a fire destroys your computer area? The statistics indicate that the loss of critical data causes a frightening percentage of businesses to close their doors. Or what if an irate employee removes all of your disk storage?

Contingency planning includes data insurance, which is at least as valuable as fire/theft insurance. The insurance company may pay for a new machine and receivables, but it cannot reproduce your data.

First, you should schedule regular backups of computer runs as frequently as you need to. Floppy disks can be corrupted, and vendor or accounting files don't re-create easily.

Second, in case of disaster, keep a copy of critical data, procedures documentation, manuals and source listings in a secure area. A fireproof, locking vault is one method, but storing this material at a different, secure location provides the best protection. And, remember, your contingency materials must be kept up-to-date.

Each potential computer user has different needs. But the above considerations are always important. The entire system must work if the user is to be satisfied.

One Approach

This approach is not the final word in consulting but, rather, an outline of the key areas potential users should consider. It is based on management-level procedures and controls analysis my company has done for larger firms.

When I'm contacted, I present a mini-tutorial to the client and find out what his requirements are. Often, he already has one or two specific packages under consideration. My tutorial includes a lay interpretation of many terms and concepts found in computer processing. Technical specifications are pretty useless if the client doesn't understand such concepts as memory, I/O and software.

I explain to the client what a complete system comprises, and offer him some criteria for selection. We then discuss some of the most important considerations: Is the system cost-effective? Is it compatible or

semistandard? Can it be expanded when the business grows? Is maintenance locally available? What is the company background of the vendor? We then order any information not in our files.

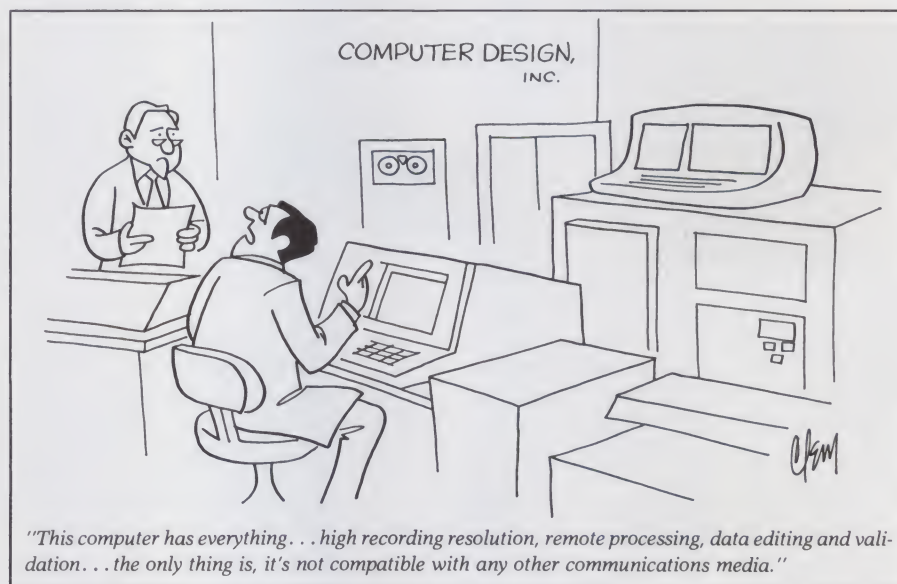
Once we've organized the information, we schedule the candidate computer vendors for demonstrations. The people who are initially responsible for the system's operation attend; they are excellent sources for feedback on a workable physical configuration, terminal and printer output quality and user functions. Once we narrow down the choices, we develop alternate configurations for the work station. The user should not dis-

ten start out with a special software package for such concerns as word processing and real estate, and evolve to where the computer is supporting all of their accounting.

Patience and education are the critical factors in the selection process. For most firms, a computer is a major investment. Better to take an extra month selecting the system than to be harassed by regret after the dollars are committed.

Installation and Training

I'm present at installation to make sure the work station is configured as planned. If the vendor offers installation, we use their experience. Other-



cover at installation time that he has no room for interface plugs.

Because a work station is a component of the system as a whole, carpentry, electrical and cabinet costs should be included in the final estimate.

A vendor's price quote usually covers hardware, software and maintenance (if available) prices. But the user needs to consider other expenses which, although more subtle, are very real. They include ac work, programming, manuals, diagnostics, disks, ribbons, print wheels, paper, accessories, training, file creation and initialization, documentation and procedures development.

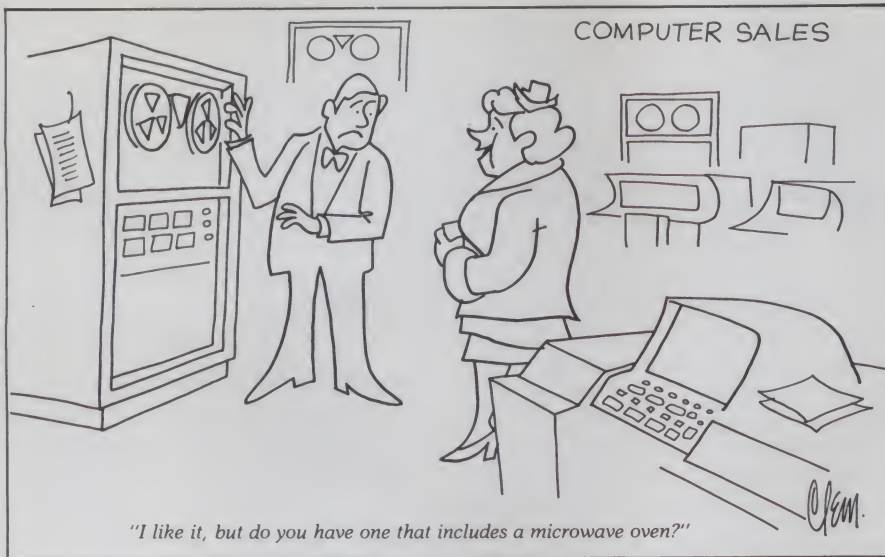
After installation, other costs arise. For instance, as the company's awareness of the computer's potential grows, so does its need for new software and peripherals. Firms of-

wise, I and a technician do it.

I don't consider the machine installed until it is functional, the software is loaded and tested, all manuals are on site and adequate supplies are available. In some cases, such as word-processing applications, my client will use the system for a period of time, and then return it to the vendor to define the most-needed user function keys.

The training process can be overwhelming for some people if they need to learn the concepts and commands in one training session. It is helpful at this stage to have technical assistance available.

While we are answering questions and clearing up misconceptions, we begin establishing processing procedures. These address time scheduling, run instructions, problem correction, file maintenance and system



care. Generally, most of the confusion that may arise at the outset is eliminated during the initialization and file creation phase.

While documentation should be outlined during the entire process, now is the time when thorough documentation is a requirement. It is often helpful to condense an operating manual into a quick-reference guide for the most-used commands, whether in a notebook or in a help file on the system. I suggest that the user keep a logbook of malfunctions, problems or repairs to provide a history of system performance. The operations procedures, if well documented, will reduce future training costs and lessen the impact of personnel turnover.

Any modifications made to a standard package must be carefully documented for future reference.

I recommend to clients that they keep the original and new listings for software and the original and new schematics for hardware. If diagnostics are available, they should be scheduled regularly.

After the Sale

After beginning normal use of your system, don't forget that conditions change and that the computer is expandable. Every six months to a year, analyze your processing. The work area may have changed, resulting in decreased efficiency. Additional development, new software, enhancements, additional terminals and so on

may now be cost-effective. Review the trouble log to spot any trends that would highlight a specific problem area. And remember: If you make changes without updating your documentation, you might do more harm than good in the future.

Conclusions

Buying your first computer system or upgrading your current system is a significant conversion. The very word "conversion" sends shivers through many data-processing managers in their third year of a two-year plan. The small-businessman or professional faces the same problems, the difference being one of scale.

Like the big shops, the key to success lies in planning, patience and adherence to procedures and controls. And, yes, in most cases there is a learning curve for your personnel that must be accounted for. After three to five days of training, a person will not normally be up to full speed and efficiency.

Be realistic about selecting and implementing a computer system. Get some nonaligned technical assistance if possible. We who are a part of the growing number of consultants must accept a professional responsibility for aiding the nontechnical person in investing company funds wisely. The enlarged concept of a system merges well with an organized business approach.

Be not discouraged! Planned carefully, the computer is an important new tool for increased efficiency and growth in your business. ■

1981 FAR EAST ELECTRONICS TOUR

The Electronics Tour for Marketing, Purchasing, Engineering, Manufacturing, & Product Development Managers and Executives to Meet with Foreign Distributors, Reps, Suppliers, & Buyers, and to Develop Foreign Business Contacts Through Individual and Group Meetings.

Date: October 7-21, 1981

and

October 8-23, 1981

HIGHLIGHTS

Japan Electronics Show in Osaka
Korea Electronics Show in Seoul

Taiwan Electronics Show in Taipei
Hong Kong Consumer Electronics Show

★ Arrangements for Group and Individual Business Meetings ★ Daily Program for Participants Interested in Importing ★ Daily Program for Participants Interested in Exporting
★ Business Briefings by Local Governments, Chambers of Commerce, and U.S. Embassy Commercial Officers ★ Free Time for Individual Appointments ★ First Class Hotel Accommodations ★ Daily Show Transportation

PRICE

From West Coast \$2,290
From East Coast \$2,655

Price Includes: airfare, hotels (double occupancy), land transportation, daily American breakfast, dinners, cocktails & city tours in each country... and more!

For more information and brochure, call or write to:

Terry Papesh,
Commerce Tours International ✓97
870 Market Street, Suite 742
San Francisco, CA 94102
(415)433-3072 or 433-3408

Call For Manuscripts

Kilobaud Microcomputing is looking for business articles!

Businessmen in all fields are beginning to take notice of the micro-computer. They are eager to know which computers, peripheral equipment and applications software will let them take full advantage of this new tool. What knowledge do you have to share?

Here are the kinds of articles that we want you to write for us:

- Are you a businessman with a system up and running? We want to know how it works. What were your expectations? Have they been fulfilled? Did you find the software that you wanted? What problems have you had? How did you overcome them? What recommendations do you have for other businessmen?

- We want reviews from a businessman's perspective of specific hardware and software. If you've recently bought a new product and want to tell others how great—or poor—it is, *Microcomputing* will provide you with a forum.

- What programs have you written to meet your specific needs? Perhaps another businessman can use them, too. Even if he can't, your program may serve as a springboard for other ideas.

- Perhaps you aren't using your micro for business, but know a company that is. Trot on down with your pencil and notebook, and find out what they're up to. While they might not have the time to write up their experiences, they might be more than willing to tell somebody else about them. And an outside observer will often be able to see things with a unique and valuable perspective.

Don't worry if you're not a professional writer. That's what we editors are here for. And we'll be more than happy to send you a copy of our writer's guidelines.

Send your manuscripts and correspondence to:

Kilobaud Microcomputing
Pine St.
Peterborough, NH 03458

**ΩMEGA
SALES
CO.** ✓89

**"WHOLESALE COMPUTER PRICES"
DIRECT TO THE PUBLIC**

East Coast: 12 Meeting St., Cumberland, RI 02864
West Coast: 3533 Old Conejo Rd, #102,
Thousand Oaks, CA 91320

PRODUCT SPECIAL of the MONTH!!

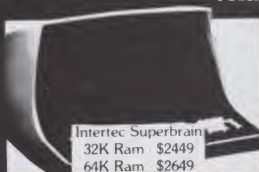


Products are
**NOW
IN
STOCK
AT
ΩMEGA
SALES
CO.**

Atari 800 16K - \$749
32K - \$849

Atari 850 Interface Module \$159

Atari 825 Printer \$695



Intertec Superbrain
32K Ram \$2449
64K Ram \$2649



Apple II - 16K, 48K
Call for Price



Epson MX 80 \$599

ΩMEGA OFFERS THE BEST DELIVERY AND PRICE ON:

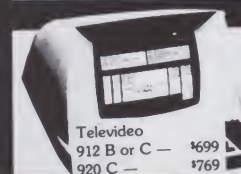
APPLE • ATARI • TRS-80 Model II • INTERTEC •
DIABLO • EPSON • HEWLETT-PACKARD • SOROC •
COMMODORE • NEC • QUME • CENTRONICS

Centronics - Ltd. quan.

730-3 \$ 525
737-1 \$ 625
704-9 \$1250
730-1 \$ 525
753 \$1750
703-9 \$1550



NEC spinwriter
5510-5530 - \$2449



Televideo
912 B or C — \$699
920 C — \$769



Diablo 630 - \$1995
(with tractor feed) \$2195

ΩMEGA sells only quality merchandise to our customers.

ΩMEGA will try to match any current advertised price with similar purchase conditions. Before you buy anywhere else — be sure to call ΩMEGA Sales Co.

West Coast
1-805-499-3678

East Coast
1-401-722-1027

CALL TOLL FREE FOR ΩMEGA'S PRICE!

East Coast: 1-800-556-7586

Telex: 952106



ΩMEGA ships via UPS, truck, or air. COD's.
Visa, Mastercharge accepted, with no service charge.





Astrology and The Microcomputer

By J. Lee Lehman

Astrology has entered the computer age. Some 3½ percent of astrologers today own micros, and the figure is rising. Another 25 percent use either astrological computing services or their friends' micros. Companies like Astro-Graphic Services are offering increasingly sophisticated software for such computers as the Apple, PET and TRS-80.

Astrologers are finding that computers can be invaluable aids in a number of areas. They save time, make calculations easier for astrologers who have trouble with math and can pave the way for large statistical research projects. Most importantly, they free the astrologer to concentrate on chart interpretation.

How is it that astrology can be compatible with a space-age technology like computers? First, astrology is *not* the daily newspaper horoscope; we would have been better off if those had gone out with the Middle Ages. Rather, it is the study of the locations of the sun, moon, and the planets and some of the asteroids at the time of someone's—or something's—birth. An astrologer needs to know the exact birth time, and accurate calculations are critical to accurate forecasts and interpretations. The computer is an ideal means of achieving this goal.

The Basis of Astrology

The premise of astrology is that

there is a connection between planetary locations at birth and the way in which an individual's life unfolds.

Why such a connection exists is unknown, but it has been established by such writers as Dr. Michel Gauquelin. Gauquelin studied the birth charts of thousands of sports figures, physicians and scientists, soldiers, artists, actors, journalists, politicians, business executives, writers and musicians.

He found that the locations of Jupiter, Mars, Saturn and the moon were not random for those who were more successful.

The calculated probability of his results occurring by chance runs from 1 in 100 for journalists to 1 in 5 million for sports champions. When was the last time you saw a behavioral study with a chance probability of 1 in 5 million?

While Gauquelin's work does not by any means prove that astrology works, he has established that there is something to planetary effects. And that is where your friendly local astrologer comes in. Any decent professional astrologer should be able to give you a fairly detailed personality description, and tell you what's doing with your mid-life crisis, or whether you should consider changing careers, or when the investment climate is good for you.

When I do a reading for a client, I generally calculate three separate horoscopes or charts: the birth (natal)

chart and two supplemental ones which give me a handle on what the client is going through that year. These calculations could easily take several hours by hand, 45 minutes by calculator and about 20 minutes by microcomputer. When I do it on the computer, that 20 minutes gives me more information than I would have gotten via calculator, because it's just too much trouble to do some calculations routinely.

Computerization Arrives

Computerization has been creeping up on astrologers gradually. First, the ephemerides—books that list daily planetary locations—began to be calculated by computer. Then, in 1971, Neil Michelsen, then with IBM, founded Astro Computing Services (ACS). ACS, which now uses a Prime 350 minicomputer, rapidly built up a reputation for both accurate charts and fast service. They also produce ephemerides and other reference books which have become the most trustworthy in the field. An astrologer could get the three above charts calculated for about \$7.

A number of other computer services followed, with varying degrees of accuracy. (I've seen some printouts from the early period which were virtually useless.) Of comparable accuracy, and somewhat lower

Dr. J. Lee Lehman resides at 325 E. 21st St., #25, New York, NY 10010.





The author on the trail of a hot horoscope. The graphic on the screen is part of the MATRIX Software Natal Chart Program for the TRS-80. (Photo by Tee A. Corinne.)

According to Weingarten, "Fifty percent of astrologers buy computers for computers, and astrology is the extra reason, or excuse, for buying. Fifty percent are buying because they can't do the math. The ones who are not mathematically sophisticated will often buy the dedicated DR-70, or a very simple computer, 16K. The people who are into more sophisticated uses will buy more memory, a printer and disks."

The computer sophisticates are finding themselves with more options. In June 1980, AGS made their disk-based software available for the TRS-80 and Apple II. These disk programs feature better graphics and more precision, which in this case means that they are accurate for both 19th and 20th century births. (The MATRIX 16K programs lose out on the accuracy of the positions of the planets Jupiter through Pluto if you go back much earlier than 1900.)

I asked Robert Hand of AGS if he thought they were pricing themselves out of the market, since those of us who build our systems by upgrading would already have the MATRIX programs. He replied, "Our object is to allow people the option of buying computer service quality software for micros; we're just making our software available in addition to our chart calculation."

The disk-based systems promise a considerable savings in time, since quite a number of different modules

can be run off the main natal calculations. (Unfortunately, the MATRIX programs are all separate, so that the birth chart has to be recalculated along with each different kind of supplemental chart, a considerable time-waster.) Hand added that AGS will soon market astronomy programs as well, including planetary observation (angles, declinations and times) and fixed stars.

Looking Ahead

What's ahead for astrology in the computer age? Computers are certainly *not* putting astrologers out of work; if anything, they are making us work harder.

Previously, the most limiting factor in providing a reading was the amount of time one had to devote to the tedious calculations necessary to provide answers to specific questions. For instance, suppose a client is wondering whether he or she would be better off moving to a new location. By calculating one supplemental chart (that's seven minutes with good calculator technique), the astrologer can determine whether the client is likely to move during the course of the next year. If the answer is yes, then the next question is where to move to: the next town, across country, north or south?

Ideally, the astrologer calculates either a relocation chart for each city the client is considering, or at least the predominant planetary influ-

ences for each location. (Yet another facet of computerized astrology to provide a world view of the effects of location was developed by Jim Lewis. His Astro*Carto*Graphy printouts provide a map of the world and the individual's planetary strengths for all locations.) This is going to require a few minutes of time per location. It is apparent that without a computer it becomes difficult to give an immediate answer to a client during the course of a reading.

Other kinds of questions can also be answered almost immediately with the computer, provided the astrologer takes the time to write a few utility programs. I have found that since I got my computer, my readings are both more detailed and more attuned to the issues that concern the client.

Another important change of the computer age is that astrologers are now in a better position to evaluate the many methods of chart interpretation which have been kicking around. Astrology is in a transitional period; a lot of rules are still around from centuries ago. Computers are providing the means to test them on large numbers of charts.

This is especially important because most of the major astrological discoveries of the past few centuries—besides learning about the planets and asteroids discovered during this period—have consisted of finding some new calculation to answer a specific question. There are so many different techniques around that few astrologers have had the opportunity to try very many of them on more than one or two charts. As a result, it has been very difficult to sort out which techniques are generally applicable to a large number of situations. Now the limiting factor is the willingness of the astrologer to write new programs.

Computerization is making it feasible to do statistical research on a massive scale. Accordingly, the possibility of building up an astrological data base—of people who have food allergies, or club feet or whatever—is more exciting.

For the layperson, the entry of computers into astrology increases the likelihood that the birth chart is accurate. Computers are freeing the astrologer to do what he or she does best: chart interpretation.

If you want to evaluate the validity of astrology for yourself, consider shelling out the \$30–50 to your local

computerized astrologer for a reading. If you like what you hear, you just might find another use for your micro! ■

References

- Astro*Carto*Graphy, PO Box 22293-U, San Francisco, CA 94122.
- Astro Computing Services, PO Box 16297, San Diego, CA 92116.
- Astro-Graphics Services, 217 Rock Harbor Road, Orleans, MA 02653.
- Astrological Services International, 127 Madison Ave., New York, NY 10016.
- *Astrology Now*, Issue #27, "The Computer Boom." Published by Llewellyn Publications, 213 E. 4th St., St. Paul, MN 55101.
- Erlewine, Michael. 1980. *Manual of Computer Programming for Astrologers*. American Federation of Astrologers, Inc., PO Box 22040, Tempe, AZ 85282. 216 pp.
- Gauquelin, Michel. 1978. *Cosmic Influences on Human Behavior*. ASI Publishers (see above); New York. 319 pp.
- MATRIX Software, 1041 N. Main St., Ann Arbor, MI 48104.

MAGIC WAND™ \$325.

This powerful word processor (new version 1.1) is now ready for



We stock most CP/M 8" single density disk formats (inc. TRS, Vector, North Star, etc.), plus Apple. We customize Magic Wand for most systems: specify CPU, terminal, printer.

Our fully interactive Mail Magic™ mail management software, with 14 user defined fields and full merge and sort capability is available for \$149. CP/M required.

✓ 133

COMPUTER CTY
PO Box 60284 K
Houston TX 77205
(713) 821-2702

TM Magic Wand is a trademark of
Small Business Applications



March Specials!

Disk Based System: Apple II or Apple II Plus with 48k RAM installed, Disk II with controller, RF Modulator; New DOS 3.3 only \$1799 shipped free continental U.S.
Buy a 16k Apple II or Apple II Plus for \$1195; get 32k more memory, installed, and RF modulator, FREE!

PAPER TIGER® SALE!

IDS 440G printer \$799.95
IDS 445G printer 835.00
IDS 460G printer 1249.00
quantities limited

CALL TOLL FREE
(800) 621-5802



ERICKSON
COMMUNICATIONS ✓ 254
Chicago, IL 60630
5456 North Milwaukee Ave.
(312) 631-5181 (within Illinois)

THE FIRST TRS-80® COMPATIBLE COMPUTER WITH HIGH DENSITY COLOR GRAPHICS!



LNW80

PC BOARD **\$89.95**

**LNW
RESEARCH**

✓ 198

LNW RESEARCH 3183-E AIRWAY AVE COSTA MESA CA 92626 714-641-8850

* Apple II is a TM of Apple Computer, Inc.
TRS-80 is a TM of Tandy Corp.

LNW RESEARCH introduces the LNW80, a high performance color computer, compatible with the TRS-80™ Model I. The fully integrated LNW80 is a sophisticated and versatile microcomputer with the following powerful features.

COMPATIBILITY

Hardware and software compatible to the Radio Shack TRS-80™ Model I computer, provides the widest software base of any microcomputer. cassette interface; expansion bus

DISPLAY

Quality upper and lower case display.

Two modes of color graphics, high resolution graphics, 384 x 192 in eight colors - higher density than the Apple II! Low density color graphics of 128 x 192 are also available in eight colors.

High resolution - black and white graphics - of 384 x 192 mixed with text and TRS-80™ standard graphics.

Reverse video, composite video RF output.

PERFORMANCE

The LNW80 utilizes the fast Z-80A microprocessor which executes at a speed of 4 MHz - over twice the speed of the TRS-80™ Model I.

NEW

EXTERNAL DATA SEPARATOR
ASSEMBLED
AND FULLY TESTED
\$14.95

**SYSTEM
EXPANSION**
AT
\$69.95 [PC BOARD & USER MANUAL]

- SERIAL RS232C/20 mA I/O
- FLOPPY CONTROLLER
- 32K BYTES MEMORY
- PARALLEL PRINTER PORT
- DUAL CASSETTE PORT
- REAL-TIME CLOCK
- SCREEN PRINTER BUS
- ONBOARD POWER SUPPLY
- SOFTWARE COMPATIBLE
- SOLDER MASK, SILK SCREEN

ORDERING INFORMATION

Add \$3 for postage and handling.
CA residents add 6% sales tax



Computer\ n

1: Device designed to execute a sequence of mathematical operations.

*Education
for the
Home*



Beginner's Russian

This package consists of three programs that graphically display the Cyrillic alphabet. The programs are arranged so that you progress from one to the next—building your knowledge as you progress. It includes instructions on proper pronunciation of the letters and even an introduction to simple Russian words.

Order No. 0136R \$9.95

Everyday Russian

Everyday Russian will acquaint you with the Russian words relating to: foods, places to eat, everyday signs, and the names of common stores. You will also learn the order of the Cyrillic alphabet. Each of the three divisions of this package will teach you the words and then quiz you on comprehension. You can even practice typing in Russian, using your TRS-80 keyboard as a "Cyrillic typewriter."

Order No. 0137R \$9.95

The Russian Disk

Now you can have *both* the Beginner's Russian and Everyday Russian packages on floppy disk! Requires an Expansion Interface with 16K and one disk drive.

Order No. 0121RD \$24.95

Teacher

This program allows you to input any number of questions and answers. The computer will prepare tests, give quizzes, provide up to three hints per question and even give (optional) graphic rewards for correct answers. Perfect for parents, teachers, or anyone faced with learning a lot of data in a short time.

Order No. 0065R \$9.95

Wordwatch

Four programs for budding lexicographers, etymologists, or anyone else who uses words. In WORD RACE, you must choose the proper definitions. Find the misspelled word in HIDE N SPELL. Take a pre-recorded quiz in SPELLING BEE, in which the words are played aloud! Meet variations on proper spelling in SPELLING TUTOR.

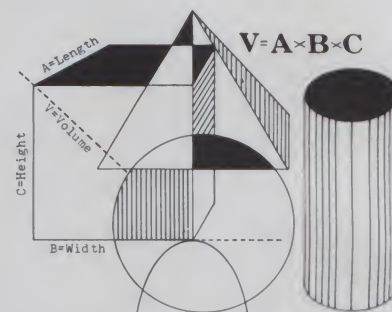
Order No. 0111R \$7.95



IQ Test

Are you smart enough to buy this package? IQ Test will administer and score an intelligence test in 30 minutes flat! There are three equivalent tests, each consisting of 35 questions, designed to test your general knowledge and problem solving abilities. Most of us claim a "touch of genius"—here's your chance to prove it!

Order No. 0157R \$9.95



Archimedes' Apprentice

A tutorial software package that will teach you the formulas used to find the volume of *any* solid object. It covers parallelepipeds (cubes and rectangular solids), prisms, pyramids, cylinders, cones and spheres. It can even quiz you on how well you learned the lesson.

Order No. 0092R \$9.95

Video Speed-Reading Trainer

You can increase your reading speed and comprehension. How? By practicing, that's how! This three-part program will flash characters or words on the screen, then you must echo what you saw. You can begin at a relatively slow rate, because the computer will advance your speed automatically as your speed and comprehension increase. It will train you with numbers, letters, words and phrases.

Order No. 0100R \$9.95

Typing Teacher

A complete seven-part package that guides you from familiarization with the keyboard, through typing words (and phrases), to mastery of touch typing. Your video monitor becomes a bottomless page for typing practice!

Order No. 0099R \$9.95

All packages listed are for the TRS-80 Model I Level II; they require 16K of memory and are cassette-based unless otherwise indicated.

Instant Software™

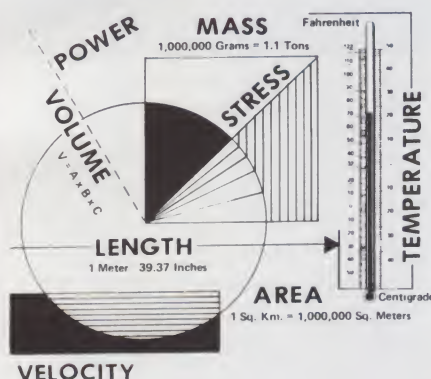
PETERBOROUGH, N.H. 03458
603-924-7296

Rebbe Akiva * John Stuart Mill * Pythagoras * Niccolo Machiavelli * Sun Tzu Wu

Education

1: The action or process of training and developing knowledge.

Education for the School



Omni-Calculator

This package is a brilliant solution to the problems involving the complex world of different units of measurement. It provides a rapid means of conversion from one unit of measurement to another in any of 10 categories: length, volume, mass, velocity, area, density, power, energy, pressure/stress, and temperature.

The Omni-Calculator is an invaluable package for scientists, electricians, teachers, doctors, surveyors, builders, plumbers, civil engineers, and pharmacists.

Order No. 0211RD \$19.95

All packages listed are for the TRS-80 Model I Level II; they require 16K of memory and are cassette-based unless otherwise indicated.

SEE YOUR
LOCAL
INSTANT
SOFTWARE
DEALER OR

Just Call Toll-Free
1-800-258-5473

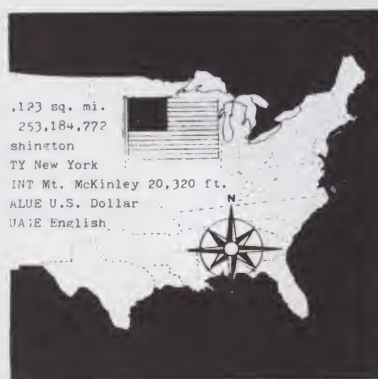
Instant Software™

PETERBOROUGH, N.H. 03458 603-924-7296

Periodic Table of the Elements

This program can be used to introduce students to the periodic table of the elements or for review by students or adults who want to refresh their memory in chemistry. It includes each of the elements' name, atomic number, weight, and symbol, its acid base and normal physical state. Enrich your knowledge of science with the PERIODIC TABLE OF THE ELEMENTS package.

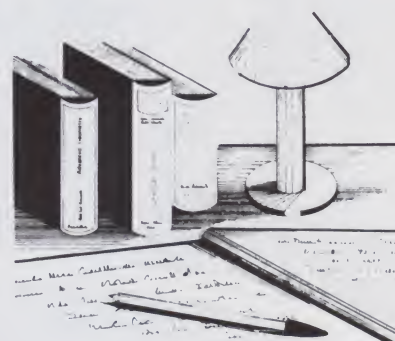
Order No. 0216R \$9.95



Geography Explorer: U.S.A.

Travel the country and learn vital facts about each of our 50 states. This package offers the most fascinating way of learning yet. Learn each state's name, capital, largest city, nickname, etc. . . . And as a bonus, this package offers the capability of a light pen.

Order No. 0071RD \$49.95



Teacher's Aide

Now you can have the benefits of Computer Assisted Instruction (CAI) in your own home. The Teacher's Aide program will let you create a teaching system for any conceivable subject. The program allows you to create a question and answer lesson (you can input up to 8000 characters per lesson). You can then save this lesson on the disk and create an entire sequence of lessons.

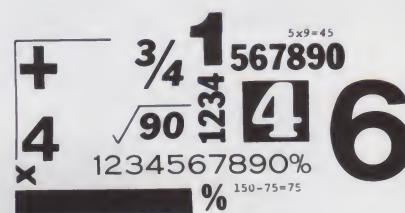
Your lessons can be tailor-made for you or your students. The options available are: (1) review the material prior to taking the lesson, (2) provide hints to help answer questions, and (3) offer a graphic display as a reward for correctly answering all the questions. The Teacher's Aide program will even allow for spelling errors!

The Teacher's Aide package is perfect for parents, teachers, and students who need the unlimited patience and undivided attention only a computer can provide. Readin', writin', and 'rithmetic will never be the same—now that you have the Teacher's Aide package from Instant Software.

This package requires the following minimum system:

1. A TRS-80 Level II with 16K RAM.
2. An Expansion Interface with 16K RAM.
3. One disk drive.
4. Any compatible Disk Operating System.

Order No. 0214RD (disk-based) \$39.95



Math Master

Math Master is an educational package designed to help you understand the math concepts of addition/subtraction/multiplication and division, through repetitive problem solving. This package also aids in fraction problem solving, and would be an asset to your program library.

Order No. 0257R \$9.95

Ptolemy * Oliver Wendell Holmes * Aeschylus * El Greco * Socrates * Voltaire * Hippocrates * Blaise Pascal

Tracking the Planets

By E. Stanton Maxey

They said it was too complex for a microcomputer; this author proved otherwise. In MBASIC.

Demands for calculating planetary coordinates are increasing. Applications range from sighting telescopes and satellite receiving antennae dishes to the erection of astrological charts.

Elliptical orbital equations can be found in any elementary physics text, but using such equations in calculating planetary coordinates to any reasonable precision is no simple task. The complexities of multiple bodies

interacting with each other within their separate orbits is severe. One professor of astronomy and computer technology has said that the task of computing positions for only three orbiting bodies was too complex for microcomputers; that at the very least a minicomputer would be required.

I needed to determine heliocentric longitudes during research into terrestrial magnetic storms. Inquiries at the Science Museum & Planetarium of Palm Beach County, FL, led me to Dr. K. F. Pulkkinen of the U.S. Naval Observatory, Washington, DC. Dr. Pulkkinen and T. C. Van Flandern co-authored *Low Precision Formulae for Planetary Positions*. This paper provides low precision formulae for geocentric and heliocentric positions of the sun, moon and planets for any epoch within 300 years of the present. Because I required only heliocentric data, the program addresses only that requirement. Expansion for geocentric data could readily be achieved.

I used Microsoft's MBASIC program, but it can be adapted to any specific BASIC with minimal editing.

The program requires ephemeris time (equivalent to Universal time for this application), time in Julian centuries and the Julian date. The Julian date (IJD) is calculated in lines 2800-2870, Universal time (ITT) in

Program listing in Microsoft MBASIC. The program examples are for planets 0 through 8 (Mercury through Jupiter) for the test date of zero hours on June 28, 1969. The precision of result is determinable by comparing the program yield to λ values found in Table 3 of the Van Flandern and Pulkkinen paper. The heliocentric longitude of planet 2 (Earth) is the reciprocal of the Sun's longitude. The program is an operational skeleton which can be readily modified by users to meet individual requirements. The author can provide a copy on punch tape for \$25.

```
10 'This program is adapted from...
    "Low-Precision Formulae for Planetary Positions"
```

```
    by T.C Van Flandern and K.F.Pulkkinen
    US Naval Observatory, Washington
20 'The Astrophysical Journal Supplement Series,
    41:391-411,1979 November
30 '
```

```
Program written by
    E. Stanton Maxey, M.D.
    921 E. Ocean Blvd.
    Stuart, Fla. 33494
40 PRINT"This is Planet."
50 DEFDBL I,B
60 DEFINT V,A,C
70 DEFSTR P
80 DIM B(33),BA(33),BB(33),P(8,50)
90 BP2=6.283185307# 'Pi*2
100 P="###.###":P1="###":P2="###"
110 BP3=1296000# 'no. arc sec in circle
120 '
```

```
Fundamental Arguments
130 BA(7)=.779072# :BB(7)=.00273790931# 'Ls
140 BA(8)=VAL(".993126") :BB(8)=.0027377785# 'Gs
150 BA(9)=.700695# :BB(9)=.011367714# 'L1
160 BA(10)=.485541# :BB(10)=.01136759566# 'G1
170 BA(11)=.566441# :BB(11)=.01136762384# 'F1
180 BA(12)=VAL(".505498") :BB(12)=VAL(".00445046867") 'L2
190 BA(13)=.140023# :BB(13)=.00445036173# 'G2
200 BA(14)=.292498# :BB(14)=.00445040017# 'F2
210 BA(15)=VAL(".987353") :BB(15)=.00145575328# 'L4
220 BA(16)=VAL(".053856") :BB(16)=.00145561327# 'G4
230 BA(17)=VAL(".849694") :BB(17)=.00145569465# 'F4
240 BA(18)=.089608# :BB(18)=.00023080893# 'L5
250 BA(19)=VAL(".056531") :BB(19)=BB(18) 'G5
260 BA(20)=VAL(".814794") :BB(20)=BB(18) 'F5
270 BA(21)=.133295# :BB(21)=.00009294371# 'L6
```

More

Dr. E. Stanton Maxey is with the Ocean Boulevard Medical Center, 921 East Ocean Blvd., Stuart, FL 33494.

line 2880 and time in Julian centuries (IT) in line 2890. (IT) is the only polynomial variable needed for the program.

Line 2920 calculates values for the fundamental arguments using Universal time (ITT) and the arguments defined in lines 130-380. These arguments are taken directly from the Pulkkinen paper. Note that val ('.821218') is used instead of (.821218#), since the B variable is defined as double precision and MBASIC likes to print these values in 16 digits. The val function saves some memory here.

The expression for heliocentric longitude—B(V)—is calculated in lines 2920-2930 and lines 3080-3280. For example, the first four terms of the series for the longitude of Jupiter are computed as follows:

```
B(V)—.089608+.00023080893·ITT=
19934·sin(.056531+.00023080893·ITT)
+5023·IT
+2511
+1093·COS(2·(.056531+.00023080893
×ITT)—5·(.0882987+.00009294371·
ITT)).
```

Arcseconds are converted to radians in line 3120. String arrays are extensively employed, since their characteristics allow incorporation of the PLON (periodic terms) in an easily accessible format. The zero string, e.g., P(8,0)='3222' in line 2570, conveys the numbers of the fundamental arguments; in this case argument 32 is found in line 370 and argument 33 in line 380. The lengths of variables P(0,0) through P(8,0) enable dynamic computation (in lines 3100-3130), depending on the number of fundamental arguments used.

Lines 3320-3390 convert arcseconds to degrees, minutes and seconds, which are then printed out as such. I consistently got precision of less than 1 minute of arc as checked by the American Ephemeris and Nautical Almanac. The exception was Pluto, which was up to 5 minutes of arc in error. This is understandable, since Van Flandern and Pulkkinen claim only 15 minutes precision for Pluto.

The program as written will require 13,700 bytes of memory after BASIC is loaded. Users short of memory can separate the program into two portions and store all string PLON arrays in magnetic memory with a shorter first program. The string variables can then be loaded from disk or cassette as part of a much shorter operating second program. ■

Listing continued.

```
280 BA(22)=.882987#;BB(22)=BB(21)'G6
290 BA(23)=VAL(".821218");BB(23)=BB(21)'F6
300 BA(24)=VAL(".870169");BB(24)=VAL(".00003269438")'L7
310 BA(25)=.400589#;BB(25)=BB(24)'G7
320 BA(26)=VAL(".664614");BB(26)=.00003265562#'F7
330 BA(27)=.846912#;BB(27)=.00001672092#'L8
340 BA(28)=VAL(".725368");BB(28)=BB(27)'G8
350 BA(29)=.480856#;BB(29)=.00001663715#'F8
360 BA(31)=VAL(".663854");BB(31)=.0000115482#'L9
370 BA(32)=.04102#;BB(32)=.00001104864#'G9
380 BA(33)=.357355#;BB(33)=BB(32)
390 P(0,0)="101113"each 2 digits=no. of fundamental argument
400 '
```

PLON coefficients

```
410 'length of string gives total arguments used
420 '+/- allows string splitting and evaluation
430 '
```

Mercury

```
440 P(0,1)="84378 0S+ 1+ 0+ 0"
450 P(0,2)="10733 0S+ 2+ 0+ 0"
460 P(0,3)="1892 0S+ 3+ 0+ 0"
470 P(0,4)="-646 0S+ 0+ 2+ 0"
480 P(0,5)="381 0S+ 4+ 0+ 0"
490 P(0,6)="-306 0S+ 1- 2+ 0"
500 P(0,7)="-274 0S+ 1+ 2+ 0"
510 P(0,8)="-92 0S+ 2+ 2+ 0"
520 P(0,9)="83 0S+ 5+ 0+ 0"
530 P(0,10)="-28 0S+ 3+ 2+ 0"
540 P(0,11)="25 0S+ 2- 2+ 0"
550 P(0,12)="19 0S+ 6+ 0+ 0"
560 P(0,13)="-9 0S+ 4+ 2+ 0"
570 P(0,14)="8 1S+ 1+ 0+ 0"
580 P(0,15)="7 0C+ 2+ 0- 5"
590 '
```

Venus

```
600 P(1,0)="081314"
610 P(1,1)="2814 0S+ 0+ 1+ 0"
620 P(1,2)="-181 0S+ 0+ 0+ 2"
630 P(1,3)="-20 1S+ 0+ 1+ 0"
640 P(1,4)="12 0S+ 0+ 2+ 0"
650 P(1,5)="-10 0C+ 2- 2+ 0"
660 P(1,6)="7 0C+ 3- 3+ 0"
670 '
```

Earth

```
680 P(2,0)="010708131619"
690 P(2,1)="6910 0S+ 0+ 0+ 1+ 0+ 0"
700 P(2,2)="72 0S+ 0+ 0+ 2+ 0+ 0"
710 P(2,3)="-17 1S+ 0+ 0+ 1+ 0+ 0"
720 P(2,4)="-7 0C+ 0+ 0+ 1+ 0+ 0- 1"
730 P(2,5)="6 0S+ 1- 1+ 0+ 0+ 0"
740 P(2,6)="5 0S+ 0+ 0+ 4+ 0- 8+ 3"
750 P(2,7)="-5 0C+ 0+ 0+ 2- 2+ 0+ 0"
760 P(2,8)="-4 0S+ 0+ 0+ 1- 1+ 0+ 0"
770 P(2,9)="4 0C+ 0+ 0+ 4+ 0- 8+ 3"
780 P(2,10)="3 0S+ 0+ 0+ 2- 2+ 0+ 0"
790 P(2,11)="-3 0S+ 0+ 0+ 0+ 0+ 0+ 1"
800 P(2,12)="-3 0S+ 0+ 0+ 2+ 0+ 0- 2"
810 '
```

Mars

```
820 P(3,0)="0813161719"
830 P(3,1)="38451 0S+ 0+ 0+ 1+ 0+ 0"
840 P(3,2)="2238 0S+ 0+ 0+ 2+ 0+ 0"
850 P(3,3)="181 0S+ 0+ 0+ 3+ 0+ 0"
860 P(3,4)="-52 0S+ 0+ 0+ 0+ 2+ 0"
870 P(3,5)="37 1S+ 0+ 0+ 1+ 0+ 0"
880 P(3,6)="-22 0C+ 0+ 0+ 1+ 0- 2"
890 P(3,7)="-19 0S+ 0+ 0+ 1+ 0- 1"
900 P(3,8)="17 0C+ 0+ 0+ 1+ 0- 1"
910 P(3,9)="17 0S+ 0+ 0+ 4+ 0+ 0"
920 P(3,10)="-16 0C+ 0+ 0+ 2+ 0- 2"
930 P(3,11)="13 0C+ 1+ 0- 2+ 0+ 0"
940 P(3,12)="-10 0S+ 0+ 0+ 1- 2+ 0"
950 P(3,13)="-10 0S+ 0+ 0+ 1+ 2+ 0"
960 P(3,14)="7 0C+ 1+ 0- 1+ 0+ 0"
970 P(3,15)="-7 0C+ 2+ 0- 3+ 0+ 0"
980 P(3,16)="-5 0S+ 0+ 1- 3+ 0+ 0"
990 P(3,17)="-5 0S+ 1+ 0- 1+ 0+ 0"
1000 P(3,18)="-5 0S+ 1+ 0- 2+ 0+ 0"
1010 P(3,19)="-4 0C+ 2+ 0- 4+ 0+ 0"
1020 P(3,20)="4 1S+ 0+ 0+ 2+ 0+ 0"
1030 P(3,21)="4 0C+ 0+ 0+ 0+ 0+ 1"
1040 P(3,22)="3 0C+ 0+ 1- 3+ 0+ 0"
1050 P(3,23)="3 0S+ 0+ 0+ 2+ 0- 2"
1060 '
```

Jupiter

```
1070 P(4,0)="18192225"
1080 P(4,1)="19934 0S+ 0+ 1+ 0+ 0"
1090 P(4,2)="5023 1C+ 0+ 0+ 0+ 0"
1100 P(4,3)="2511 0C+ 0+ 0+ 0+ 0"
1110 P(4,4)="1093 0C+ 0+ 2- 5+ 0"
```

More

TRS-80 OWNERS BASIC SLOWING YOU DOWN? TAKE ZBASIC FOR FAST RELIEF!

Introducing SIMUTEK'S ZBASIC. The truly interactive BASIC COMPILER for your TRS-80! FINALLY! People that don't have the time or the inclination to learn complicated assembly language, have a chance to write PROFESSIONAL QUALITY SOFTWARE in machine language using a subset of LEVEL II BASIC!!

What does interactive mean? It means you have ZBASIC and your BASIC program resident at the same time! You may compile a BASIC program, run it or save it without destroying your resident BASIC program! In fact, jumping back and forth between the compiled code and the BASIC code is one of its finest features!

ZBASIC allows saving your COMPILED PROGRAM as a system tape, (tape version), or as /CMD file, (disk version). THE COMPILED CODE IS VERY EFFICIENT Z80 OBJECT CODE. THE LEVEL II ROMS ARE USED ONLY FOR I/O ROUTINES!!

FACTS ABOUT ZBASIC

- 16K ZBASIC will compile a 4.8K program. (tape only)
- 32K ZBASIC will compile a 17K (tape), 10K (disk) pgm.
- 48K ZBASIC will compile a 17K program. (disk only)
- (These are approximate values depending on program efficiency etc.)
- ZBASIC DOES NOT support disk or tape files.
- BASIC programs compiled with ZBASIC are between 10-200 times faster than interpreted BASIC!!
- NO ROYALTIES ON ZBASIC COMPILED PROGRAMS!!
- ZBASIC programs are only about 1.1 times larger than the average basic program
- ZBASIC programs may be used as USR routines from basic.
- ZBASIC uses INTEGER MATH ONLY to increase speed and decrease compiled program size. Use of Single or Double precision would destroy the beauty of the first "INTERACTIVE COMPILER" on the market!
- Limited variables: A-Z, A1-Z1, A2-Z2, A\$-Z\$. Arrays are not supported to decrease memory demands and speed up compiling of programs.
- COMPILE TIMES ARE TYPICALLY 1 TO 10 SECONDS! THERE IS NO NEED TO USE COMPLICATED COMPILE TIME MODULES!
- ZBASIC comes with a HIGHLY DETAILED manual describing all important memory locations, commands, variables, warm/cold start entry points and many useful sub-routines for emulating unsupported commands!!
- Existing programs may be loaded from tape or disk and compiled as long as unsupported commands or variables are not used.

ALL COMMANDS DIRECTLY SUPPORTED BY ZBASIC

FOR	NEXT	STEP	IF	THEN	ELSE	PEEK
SET	RESET	POINT	CHRS	RANDOM	RND	POKE
DATA	READ	RESTORE	END	GOTO	GOSUB	CLS
INPUT	INKEY\$	LET	STOP	OUT	INP	RETURN
PRINT	LPRINT	PRINT@	USR	SGN	INT	ABS
SQR	LEN	ASC	VAL	STR\$	POS	ON GOTO
ON GOSUB	REM	NOT	AND	OR		

INTEGER MATH *MULTIPLY /DIVIDE +ADD -SUBTRACT ^-32767

NOTE: Some commands do not act exactly as BASIC commands act

TRS-80 MOD I and III or PMC-80 Computers. (Level II Only) NEW LOWER PRICES!

ZBASIC 16K/32K LVII Tape Version + Manual	\$79.95
ZBASIC 32K/48K Disk Version + Manual	\$89.95
Both Versions + Manual	\$99.95
ZBASIC Manual Only (Fully Refundable)	\$25.00
Model III Version Available 3/1/81	

Credit Card or C.O.D. Call **Toll Free: (800) 528-1149**
or send check or money order to:

**SIMUTEK
COMPUTER PRODUCTS™**

P.O. Box 13687 Tucson, AZ 85732 (602) 323-9391
(C.O.D. Available \$3.00 Extra)
TRS-80 is a TM of Tandy Corp

Listing continued.

```

1120 P(4,5)=-601 0S+ 0+ 2+ 0+ 0"
1130 P(4,6)=-479 0S+ 0+ 2- 5+ 0"
1140 P(4,7)=-185 0S+ 0+ 2- 2+ 0"
1150 P(4,8)=-137 0S+ 0+ 3- 5+ 0"
1160 P(4,9)=-131 0S+ 0+ 1- 2+ 0"
1170 P(4,10)=-79 0C+ 0+ 1- 1+ 0"
1180 P(4,11)=-76 0C+ 0+ 2- 2+ 0"
1190 P(4,12)=-74 1C+ 0+ 1+ 0+ 0"
1200 P(4,13)=-68 1S+ 0+ 1+ 0+ 0"
1210 P(4,14)=-66 0C+ 0+ 2- 3+ 0"
1220 P(4,15)=-63 0C+ 0+ 3- 5+ 0"
1230 P(4,16)=-53 0C+ 0+ 1- 5+ 0"
1240 P(4,17)=-49 0S+ 0+ 2- 3+ 0"
1250 P(4,18)=-43 1S+ 0+ 2- 5+ 0"
1260 P(4,19)=-37 0C+ 0+ 1+ 0+ 0"
1270 P(4,20)=-25 0S+ 2+ 0+ 0+ 0"
1280 P(4,21)=-25 0S+ 0+ 3+ 0+ 0"
1290 P(4,22)=-23 0S+ 0+ 1- 5+ 0"
1300 P(4,23)=-19 1C+ 0+ 2- 5+ 0"
1310 P(4,24)=-17 0C+ 0+ 2- 4+ 0"
1320 P(4,25)=-17 0C+ 0+ 3- 3+ 0"
1330 P(4,26)=-14 0S+ 0+ 1- 1+ 0"
1340 P(4,27)=-13 0S+ 0+ 3- 4+ 0"
1350 P(4,28)=-9 0C+ 2+ 0+ 0+ 0"
1360 P(4,29)=-9 0C+ 0+ 0+ 1+ 0"
1370 P(4,30)=-9 0S+ 0+ 0+ 1+ 0"
1380 P(4,31)=-9 0S+ 0+ 3- 2+ 0"
1390 P(4,32)=-9 0S+ 0+ 4- 5+ 0"
1400 P(4,33)=-9 0S+ 0+ 2- 6+ 3"
1410 P(4,34)=-8 0C+ 0+ 4-10+ 0"
1420 P(4,35)=-7 0C+ 0+ 3- 4+ 0"
1430 P(4,36)=-7 0C+ 0+ 1- 3+ 0"
1440 P(4,37)=-7 0S+ 0+ 4-10+ 0"
1450 P(4,38)=-7 0S+ 0+ 1- 3+ 0"
1460 P(4,39)=-6 0C+ 0+ 4- 5+ 0"
1470 P(4,40)=-6 0S+ 0+ 3- 3+ 0"
1480 '

```

Saturn

```

1490 P(5,0)=-19212225"
1500 P(5,1)=-23045 0S+ 0+ 0+ 1+ 0"
1510 P(5,2)=-5014 1C+ 0+ 0+ 0+ 0"
1520 P(5,3)=-2689 0C+ 2+ 0- 5+ 0"
1530 P(5,4)=-2507 0C+ 0+ 0+ 0+ 0"
1540 P(5,5)=-1177 0S+ 2+ 0- 5+ 0"
1550 P(5,6)=-826 0C+ 2+ 0- 4+ 0"
1560 P(5,7)=-802 0S+ 0+ 0+ 2+ 0"
1570 P(5,8)=-425 0S+ 1+ 0- 2+ 0"
1580 P(5,9)=-229 1C+ 0+ 0+ 1+ 0"
1590 P(5,10)=-153 0C+ 2+ 0- 6+ 0"
1600 P(5,11)=-142 1S+ 0+ 0+ 1+ 0"
1610 P(5,12)=-114 0C+ 0+ 0+ 1+ 0"
1620 P(5,13)=-101 1S+ 2+ 0- 5+ 0"
1630 P(5,14)=-70 0C+ 0+ 2+ 0+ 0"
1640 P(5,15)=-67 0S+ 0+ 2+ 0+ 0"
1650 P(5,16)=-66 0S+ 2+ 0- 6+ 0"
1660 P(5,17)=-60 1C+ 2+ 0- 5+ 0"
1670 P(5,18)=-41 0S+ 1+ 0- 3+ 0"
1680 P(5,19)=-39 0S+ 0+ 0+ 3+ 0"
1690 P(5,20)=-31 0S+ 1+ 0- 1+ 0"
1700 P(5,21)=-31 0S+ 2+ 0- 2+ 0"
1710 P(5,22)=-29 0C+ 2+ 0- 3+ 0"
1720 P(5,23)=-28 0S+ 2+ 0- 6+ 3"
1730 P(5,24)=-28 0C+ 1+ 0- 3+ 0"
1740 P(5,25)=-22 1S+ 2+ 0- 4+ 0"
1750 P(5,26)=-22 0S+ 2+ 0+ 1- 3"
1760 P(5,27)=-20 0S+ 2+ 0- 3+ 0"
1770 P(5,28)=-20 0C+ 4+ 0-10+ 0"
1780 P(5,29)=-19 0C+ 0+ 0+ 2- 3"
1790 P(5,30)=-19 0S+ 4+ 0-10+ 0"
1800 P(5,31)=-17 1C+ 0+ 0+ 2+ 0"
1810 P(5,32)=-16 0C+ 0+ 0+ 1- 3"
1820 P(5,33)=-12 0S+ 2+ 0- 4+ 0"
1830 P(5,34)=-12 0C+ 1+ 0+ 0+ 0"
1840 P(5,35)=-12 0S+ 0+ 0+ 2- 2"
1850 P(5,36)=-11 1S+ 0+ 0+ 2+ 0"
1860 P(5,37)=-11 0C+ 2+ 0- 7+ 0"
1870 P(5,38)=-10 0S+ 0+ 0+ 2- 3"
1880 P(5,39)=-10 0C+ 2+ 0- 2+ 0"
1890 P(5,40)=-9 0S+ 4+ 0- 9+ 0"
1900 P(5,41)=-8 0S+ 0+ 0+ 1- 2"
1910 P(5,42)=-8 0C+ 0+ 2+ 1+ 0"
1920 P(5,43)=-8 0C+ 0+ 2- 1+ 0"
1930 P(5,44)=-8 0C+ 0+ 0+ 1- 1"
1940 P(5,45)=-8 0S+ 0+ 2- 1+ 0"
1950 P(5,46)=-7 0S+ 0+ 2+ 1+ 0"
1960 P(5,47)=-7 0C+ 1+ 0- 2+ 0"
1970 P(5,48)=-7 0C+ 0+ 0+ 2+ 0"
1980 P(5,49)=-6 1S+ 4+ 0-10+ 0"
1990 P(5,50)=-6 1C+ 4+ 0-10+ 0"
2000 '

```

Uranus

```

2010 P(6,0)=-1922252628"
2020 P(6,1)=-19397 0S+ 0+ 0+ 1+ 0+ 0"
2030 P(6,2)=-570 0S+ 0+ 0+ 2+ 0+ 0"

```

More

Listing continued.

```

2040 P(6,3)="-536 1C+ 0+ 0+ 1+ 0+ 0"
2050 P(6,4)="-143 0S+ 0+ 1- 2+ 0+ 0"
2060 P(6,5)="-110 1S+ 0+ 0+ 1+ 0+ 0"
2070 P(6,6)="-102 0S+ 0+ 1- 3+ 0+ 0"
2080 P(6,7)="-76 0C+ 0+ 1- 3+ 0+ 0"
2090 P(6,8)="-49 0S+ 1+ 0- 1+ 0+ 0"
2100 P(6,9)="-32 2C+ 0+ 0+ 0+ 0+ 0"
2110 P(6,10)="-30 1C+ 0+ 0+ 2+ 0+ 0"
2120 P(6,11)="-29 0S+ 2- 6+ 3+ 0+ 0"
2130 P(6,12)="-29 0C+ 0+ 0+ 2+ 0- 2"
2140 P(6,13)="-28 0C+ 0+ 0+ 1+ 0- 1"
2150 P(6,14)="-23 0S+ 0+ 0+ 3+ 0+ 0"
2160 P(6,15)="-21 0C+ 1+ 0- 1+ 0+ 0"
2170 P(6,16)="-20 0S+ 0+ 0+ 1+ 0- 1"
2180 P(6,17)="-20 0C+ 0+ 1- 2+ 0+ 0"
2190 P(6,18)="-19 0C+ 0+ 1- 1+ 0+ 0"
2200 P(6,19)="-17 0S+ 0+ 0+ 2+ 0- 3"
2210 P(6,20)="-14 0S+ 0+ 0+ 3+ 0- 3"
2220 P(6,21)="-13 0S+ 0+ 1- 1+ 0+ 0"
2230 P(6,22)="-12 2C+ 0+ 0+ 1+ 0+ 0"
2240 P(6,23)="-12 0C+ 0+ 0+ 1+ 0+ 0"
2250 P(6,24)="-10 0S+ 0+ 0+ 2+ 0- 2"
2260 P(6,25)="-9 0S+ 0+ 0+ 0+ 2+ 0"
2270 P(6,26)="-9 2S+ 0+ 0+ 1+ 0+ 0"
2280 P(6,27)="-9 0C+ 0+ 0+ 2+ 0- 3"
2290 P(6,28)="-8 1C+ 0+ 1- 2+ 0+ 0"
2300 P(6,29)="-7 1C+ 0+ 1- 3+ 0+ 0"
2310 P(6,30)="-7 1S+ 0+ 1- 3+ 0+ 0"
2320 P(6,31)="-7 1S+ 0+ 0+ 2+ 0+ 0"
2330 P(6,32)="-6 0S+ 2- 6+ 2+ 0+ 0"
2340 P(6,33)="-6 0C+ 2- 6+ 2+ 0+ 0"
2350 P(6,34)="-5 0S+ 0+ 1- 4+ 0+ 0"
2360 P(6,35)="-4 0S+ 0+ 0+ 3+ 0- 4"
2370 P(6,36)="-4 0C+ 0+ 0+ 3+ 0- 3"
2380 P(6,37)="-3 0C+ 0+ 0+ 0+ 0+ 1"
2390 P(6,38)="-2 0S+ 0+ 0+ 0+ 0+ 1"
2400 '

```

Neptune

```

2410 P(7,0)="-1922252829"
2420 P(7,1)="-3523 0S+ 0+ 0+ 1+ 0"
2430 P(7,2)="-50 0S+ 0+ 0+ 0+ 2"
2440 P(7,3)="-43 1C+ 0+ 0+ 0+ 1+ 0"
2450 P(7,4)="-29 0S+ 1+ 0+ 0- 1+ 0"
2460 P(7,5)="-19 0S+ 0+ 0+ 0+ 2+ 0"
2470 P(7,6)="-18 0C+ 1+ 0+ 0- 1+ 0"
2480 P(7,7)="-13 0C+ 0+ 1+ 0- 1+ 0"
2490 P(7,8)="-13 0S+ 0+ 1+ 0- 1+ 0"
2500 P(7,9)="-9 0S+ 0+ 0+ 2- 3+ 0"
2510 P(7,10)="-9 0C+ 0+ 0+ 2- 2+ 0"
2520 P(7,11)="-5 0C+ 0+ 0+ 2- 3+ 0"
2530 P(7,12)="-4 1S+ 0+ 0+ 0+ 1+ 0"
2540 P(7,13)="-4 0C+ 0+ 0+ 1- 2+ 0"
2550 P(7,14)="-4 2S+ 0+ 0+ 0+ 1+ 0"
2560 '

```

Pluto

```

2570 P(8,0)="-3233"
2580 P(8,1)="-101577 0S+ 1+ 0"
2590 P(8,2)="-15517 0S+ 2+ 0"
2600 P(8,3)="-3593 0S+ 0+ 2"
2610 P(8,4)="-3414 0S+ 3+ 0"
2620 P(8,5)="-2201 0S+ 1- 2"
2630 P(8,6)="-1871 0S+ 1+ 2"
2640 P(8,7)="-839 0S+ 4+ 0"
2650 P(8,8)="-757 0S+ 2+ 2"
2660 P(8,9)="-285 0S+ 3+ 2"
2670 P(8,10)="-227 2S+ 1+ 0"
2680 P(8,11)="-218 0S+ 2- 2"
2690 P(8,12)="-200 1S+ 1+ 0"
2700 '

```

Problem Insertion

```

2710 PRINT"Insert Problem"
2720 PRINT"Planets are sequentially numbered."
2730 PRINT" Mercury = 0."
2740 PRINT" Venus = 1."
2750 PRINT" Pluto = 8."
2760 PRINT"Number >8 = End.":PRINT""
2770 INPUT"Planet Number";A
2780 IF A>8 THEN END
2790 '

```

Convert Gregorian calendar to Julian Date.

```

2800 INPUT"Month";IM
2810 INPUT"Day";ID
2820 INPUT"Year";IY
2830 IJD=367*IY
2840 IJD=IJD-FIX(7*(IY+FIX((IM+9)/12))/4)
2850 IJD=IJD-FIX(3*(FIX((IY+FIX((IM-9)/7))/100)+1)/4)
2860 IJD=IJD+FIX(275*IM/9)+ID+1721029#
2870 IJD=IJD-.5#half day diff in standard
2880 ITT=IJD-2451545#ITT=t
2890 IT=ITT/36525#1#IT=Time in Julian Centuries
2900 GOTO 2950
2910 'B(7-33)=Fundamental Arguments in dbl precision

```

(More)

APPLE II QUALITY DISK SOFTWARE

HOME FINANCE PAK I: Entire Series \$49.95

- ☐ CHECK REGISTER AND BUDGET: This comprehensive CHECKING ACCOUNT MANAGEMENT SYSTEM not only keeps complete records, it also gives you the analysis and control tools you need to actively manage your account. The system provides routines for BUDGETING INCOME AND EXPENSE, AUTOMATIC CHECK SEARCH, and BANK STATEMENT RECONCILING. CRT or printer reports are produced for ACTUAL EXPENSE vs BUDGET, CHECK SEARCH DISPLAY, RECONCILIATION REPORT and CHECK REGISTER DISPLAY by month. Check entry is prompted by user-defined menus of standard purposes and recipient codes, speeding data entry and reducing disk storage and retrieval time. Six fields of data are stored for each check: amount, check no., date, purpose, recipient and TAX DEDUCTIBLE RE-MINOR. CHECK SEARCH routines allow searching on any of these data fields. Routines also provided for CHECK SORT by date and check no., DATA EDITING and Report Formats. Up to 100 checks/mo. storage. \$39.95
- ☐ SAVINGS: Account management system for up to 20 separate Savings accounts. Organizes, files and displays deposits, withdrawals and interest earned for each account. Complete records shown via CRT or printer. \$14.95
- ☐ CREDIT CARD: Get control of your credit cards with this program. Organizes, stores and displays purchases, payments and service charges for up to 20 separate cards. Use for credit cards or bank loans. CRT or printer reports. \$14.95

UNIVERSAL COMPUTING MACHINE: \$49.95

- ☐ A user programmable computing system structured around a 50 row x 50 column table. User defines row and column names and equations forming a unique computing machine. Table elements can be multiplied, divided, subtracted or added to any other element. User can define repeated functions common to a row or column greatly simplifying table setup. Hundreds of unique computing machines can be defined, used, stored and recalled, with or without old data, for later use. Excellent for sales forecasts, engineering design analysis, budgets, inventory lists, income statements, production planning, project cost estimates-in short for any planning, analysis or reporting problem that can be solved with a table. Unique cursor commands allow you to move to any element, change its value and immediately see the effect on other table values. Entire table can be printed by machine pages (user-defined 3-5 columns) on a 40 column printer. \$49.95

COLOR CALENDAR: \$29.95

- ☐ HI-RES color graphics display of your personal calendar. Automatic multiple entry of repetitive events. Review at a glance important dates, appointments, anniversaries, birthdays, action dates, etc. over a 1 year period. Graphic calendar marks dates. Printer and screen display a summary report by month of your full text describing each day's action item or event. Ideal for anyone with a busy calendar. \$29.95

BUSINESS SOFTWARE: Entire Series \$159.95

- ☐ MICROACCOUNTANT: The ideal accounting system for the small business. Based on classic T accounts and double-entry bookkeeping, this efficient program records and produces reports on account balances, general ledger journals, revenue and expenses. Screen or 40 column printer reports. Handles up to 1000 journal entries per month up to 300 accounts. Includes a short primer in Financial Accounting. \$49.95
- ☐ UNIVERSAL BUSINESS MACHINE: This program is designed to SIMPLIFY and SAVE TIME for the serious businessman who must periodically Analyze, Plan and Estimate. The program was created using our Universal Computing Machine and it is programmed to provide the following planning and forecasting tools:
CASH FLOW ANALYSIS PROFORMA BALANCE SHEET SOURCE AND USE OF FUNDS
PROFORMA PROFIT & LOSS SALES FORECASTER JOB COST ESTIMATOR
Price, including a copy of the Universal Computing Machine. \$89.95

- ☐ BUSINESS CHECK REGISTER AND BUDGET: Our Check Register and Budget programs expanded to include up to 50 budgetable items and up to 400 checks per month. Includes bank statement reconciling and automatic check search (48K). \$49.95

ELECTRONICS SERIES: Entire Series \$259.95

- ☐ LOGIC SIMULATOR: SAVE TIME AND MONEY. Simulate your digital logic circuits before you build them. CMOS, TTL, or whatever, if it's digital logic, this program can handle it. The program is an interactive, menu driven, full-fledged logic simulator capable of simulating the bit-time by bit-time response of a logic network to user-specified input patterns. It will handle up to 1000 gates, including NANDS, NORs, INVERTERS, FLIP-FLOPS, SHIFT REGISTERS, COUNTERS and user-defined MACROS. Up to 40 user-defined, random, or binary input patterns. Simulation results displayed on CRT or printer. Accepts network descriptions from keyboard or from LOGIC DESIGNER for simulation. \$159.95
- ☐ LOGIC DESIGNER: Interactive HI-RES Graphics program for designing digital logic systems. A menu driven series of keyboard commands allows you to draw directly on the screen up to 15 different gate types, including 10 gate shape patterns supplied with the program and 5 reserved for user specification. Standard patterns supplied are NAND, NOR, INVERTER, EX-OR, T-FLOP, JK-FLOP, D-FLOP, RS-FLOP, 4 Bit COUNTER and 8-BIT SHIFT REGISTER. User interconnects gates just as you would normally draw using line graphics commands. Network descriptions for LOGIC SIMULATOR generated simultaneously with the CRT diagram being drawn. \$159.95
- ☐ MANUAL AND OEMO DISK: Instruction manual and demo disk illustrating capabilities of both programs. \$29.95

MATHEMATICS SERIES: Entire Series \$49.95

- ☐ STATISTICAL ANALYSIS I: This menu driven program performs SIMPLE LINEAR REGRESSION analysis, determines the mean, standard deviation and plots the frequency distribution of user-supplied data sets. Printer, Disk, I/O and edit routines included (32K min.). \$19.95
- ☐ NUMERICAL ANALYSIS: HI-RES 2-Dimensional plot of any function. Automatic scaling. At your option, the program will plot the function, plot the INTEGRAL, plot the DERIVATIVE, determine the ROOTS, find the MAXIMA and MINIMA and list the INTEGRAL VALUE. \$19.95
- ☐ MATRIX: A general purpose, menu driven program for determining the INVERSE and DETERMINANT of any matrix, as well as the SOLUTION to any set of SIMULTANEOUS LINEAR EQUATIONS. Disk I/O for data save. Specify 55 eqn. set (48K) or 35 eqn. (32K). \$19.95
- ☐ 3-D SURFACE PLOTTER: Explore the ELEGANCE and BEAUTY of MATHEMATICS by creating HI-RES PLOTS of 3-dimensional surfaces from any 3-variable equation. Disk save and recall routines for plots. Menu driven to vary surface parameters. Hidden line or transparent plotting. \$19.95

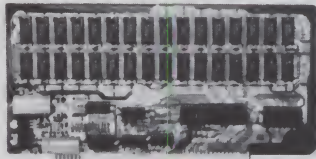
ACTION ADVENTURE GAMES: Entire Series \$29.95

- ☐ REO BARON: Can you outfly the REO BARON? This fast action game simulates a machine gun OOG-FIGHT between your WORLD WAR I BI-PLANE and the baron's. You can LOOP, DIVE, BANK or CLIMB in any one of 8 directions - and so can the BARON. In HI-RES graphics. \$14.95
- ☐ BATTLE OF MIDWAY: You are in command of the U.S.S. HORNETS' DIVE-BOMBER squadron. Your targets are the Aircraft carriers, Akagi, Soryu and Kaga. You must fly your way through ZEROS and AA FIRE to make your DIVE-BOMB run. In HI-RES graphics. \$14.95
- ☐ SUB ATTACK: It's April, 1943. The enemy convoy is headed for the CORAL SEA. Your sub, the MORAY, has just sighted the CARRIERS and BATTLESHIPS. Easy pickings. But watch out for the DE-STROYERS - they're fast and deadly. In HI-RES graphics. \$14.95

- ☐ FREE CATALOG: All programs are supplied on disk and run on Apple II w/Disk & Applesoft ROM Card & TRS-80 Level II and require 32K RAM unless otherwise noted. Detailed instructions included. Orders ship paid within 5 days. Card users include card number. Add \$1.50 postage and handling with each order. California residents add 6% sales tax. Foreign orders add \$5.00 postage and handling.

Make checks payable to:
SPECTRUM SOFTWARE 306
P.O. Box 2084 142 Carlow, Sunnyvale, CA 94087
For phone orders - 408-738-4387
DEALER INQUIRIES INVITED

The days of complicated, unreliable, dynamic RAM are gone:



INTRODUCING JAWS

the ultrabyte memory board

\$199.95 (complete kit with 16K memory)

Netronics consistently offers innovative products at unbeatable prices. And here we go again — with JAWS, the ultrabyte 64K S100 memory board.

ONE CHIP DOES IT ALL

JAWS solves the problems of dynamic RAM with a state-of-the-art chip from Intel that does it all. Intel's single chip 64K dynamic RAM controller eliminates high-current logic parts... delay lines... massive heat sinks... unreliable trick circuits.

REMARKABLE FEATURES OF JAWS

Look what JAWS offers you: Hidden refresh... fast performance... low power consumption... latched data outputs... 200 NS 4116 RAMs... on-board crystal... 8K bank selectable... fully socketed... solder mask on both sides of board... designed for 8080, 8085, and Z80 bus signals... works in Explorer, Sol, Horizon, as well as all other well-designed S100 computers.

GIVE YOUR COMPUTER A BIG BYTE OF MEMORY POWER WITH JAWS — SAVE UP TO \$90 ON INTRODUCTORY LIMITED-OFFER SPECIAL PRICES!

UNDECIDED? TRY A WIRED 16K JAWS IN YOUR COMPUTER ON OUR 10-DAY MONEY-BACK OFFER (SPECIFY YOUR COMPUTER).

CONTINENTAL U.S.A. CREDIT CARD BUYERS: DUTY-SIDE CONNECTICUT CALL

CALL TOLL FREE 800-243-7428

From Connecticut Or For Assistance: (203) 354-9375

NETRONICS RESEARCH & DEVELOPMENT LTD.

333 Litchfield Road, New Milford, CT 06776

Please send the items checked below: KB3

- ☐ JAWS 16K RAM kit, No. 6416, \$199.95.*
- ☐ JAWS 16K RAM fully assembled, tested, burned in, No. 6416W, \$229.95.*
- ☐ JAWS 32K RAM kit, No. 6432, (reg. price \$329.95), SPECIAL PRICE \$299.95.*
- ☐ JAWS 32K RAM fully assembled, tested, burned in, No. 6432W, (reg. price \$369.95), SPECIAL PRICE \$339.95.*
- ☐ JAWS 48K RAM kit, No. 6448, (reg. price \$459.95), SPECIAL PRICE \$399.95.*
- ☐ JAWS 48K fully assembled, tested, burned in, No. 6448W, (reg. price \$509.95), SPECIAL PRICE \$449.95.*
- ☐ JAWS 64K RAM kit, No. 6464, (reg. price \$589.95), SPECIAL PRICE \$499.95.*
- ☐ JAWS 64K RAM fully assembled, tested, burned in, No. 6464W, (reg. price \$649.95), SPECIAL PRICE \$559.95.*
- ☐ Expansion kit, JAWS 16K RAM module, to expand any of the above in 16K blocks up to 64K, No. 16EXP \$129.95.*

*All prices plus \$2 postage and handling. Connecticut residents add sales tax.

Total enclosed: \$

- ☐ Personal Check ☐ Money order or Cashiers Check
- ☐ VISA ☐ MASTER CHARGE (Bank No.)

Acct. No. _____ Exp. Date _____

Signature _____

Print Name _____

Address _____

City _____

State _____ Zip _____

☐ Send me more information

Listing continued.

```
2920 B(V)=BA(V)+BB(V)*ITT
2930 B(V)=B(V)-FIX(B(V))'Get part of revolution
2940 RETURN
2950 '
```

A=No. of planet being processed

```
2960 ON A+1 GOTO 2970,3000,3010,3020,3030,3040,3050,3060,3070
2970 V=9:V1=15:GOTO 3080'Mercury
2980 'V=No. of 'L' argument
2990 'V1=No. iterations for individual planet
3000 V=12:V1=6:GOTO 3080'Venus
3010 V=7:V1=12:GOTO 3080'Earth reciprocal of Sun
3020 V=15:V1=23:GOTO 3080'Mars
3030 V=18:V1=40:GOTO 3080'Jupiter
3040 V=21:V1=50:GOTO 3080'Saturn
3050 V=24:V1=38:GOTO 3080'Uranus
3060 V=27:V1=14:GOTO 3080'Neptune
3070 V=31:V1=12:GOTO 3080'Pluto
3080 GOSUB 2920
3090 BL(A)=B(V)*BP3'L in arc secs
3100 FOR C=1 TO LEN(P(A,0)) STEP 2
3110 '
```

calculate Plon Trig Arguments

```
3120 V=VAL(MIDS(P(A,0),C,2)):GOSUB 2920:B(V)=B(V)*BP2'b(v) in radians
3130 NEXT C
3140 BG(A)=BL(A)'bq(a)=lambda
3150 FOR V=1 TO V1'V1=No. of iterations
3160 V2=INSTR(P(A,V),"")-1
3170 BCO=VAL(LEFT$(P(A,V),V2))'BCO=Coefficient peeled off data string
3180 ITF=VAL(MIDS(P(A,V),V2+2,1))'ITF='T' factor peeled out of data string
3190 IF ITF<>0 THEN BCO=BCO*IT*ITF'Multiply by T factor if >0
3200 FOR V3=1 TO LEN(P(A,0))/2
3210 BV=VAL(MIDS(P(A,0),2*V3-1,2))
3220 BT=BT+VAL(MIDS(P(A,V),V2+1+3*V3,3))*B(BV)
3230 NEXT V3
3240 '
```

Do either sine or cosine

```
3250 IF MIDS(P(A,V),V2+3,1)="C" THEN 3270
3260 BG(A)=BG(A)+BCO*SIN(BT):GOTO 3280
3270 BG(A)=BG(A)+BCO*COS(BT)
3280 BT=0:NEXT V
3290 IF A=2 THEN BG(A)=BG(A)+648000#
      recip of Sun for Earth
3300 IF BG(A)>BP3 THEN BG(A)=BG(A)-BP3
3310 IF BG(A)<0 THEN BG(A)=BG(A)+BP3:GOTO 3310
3320 PRINT"Lambda="BG(A)"Arc Sec"
3330 BM=FIX(BG(A)/60#)
3340 BS=BG(A)-BM*60#
3350 BD=FIX(BM/60#)
3360 BM=BM-BD*60#:IF BD=-1 AND BM=60 THEN BD=0:BM=0
3370 PRINT USING P2;BD;:PRINT" ";
3380 PRINT USING P1;BM;:PRINT" ";
3390 PRINT USING P;BS;:PRINT CHR$(34)
3400 PRINT"":PRINT"Insert New Problem"
3410 GOTO 2720
```

HIGH SPEED 16K MEMORY \$24.00

Set of 8 4116 RAM chips, for use in Apple, Heath, Pet or TRS-80. Add \$3.00 for shipping & handling (CA residents add 6% sales tax).

Visa, Mastercharge orders
800-538-8559 (outside CA).

exatron ✓57

181 Commercial Street
Sunnyvale, CA 94086

408-737-7111

MAXELL® OR **Dysan**

Some computerists pay less - but may not receive Shugart® or IBM® approved disks.

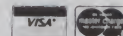
8" SINGLE SIDE DOUBLE DENSITY.....Box of 10 for \$60

8" DOUBLE SIDE DOUBLE DENSITY.....Box of 10 for \$70

5 1/4" MINI.....Box of 10 for \$50

DYSAN® DISKS
5 1/4" MINI.....Box of 5 for \$25

(Specify - 8" Soft or Hard Sector/5" Soft or Hard Sector)



C.O.D. \$1.00 Additional

Custom Electronics Inc.

238 EXCHANGE STREET
CHICOPEE, MA. 01013

413-592-4761

✓141

established 1960 - closed Mondays

ATARI TI/99-4 PET



ANYONE
who can't expertly assemble
with the Apple II®
and this
easy-to-use package...



just isn't meant to program.

If you're really interested in programming...assembly language is the only way to go. It's faster, more versatile, and lets you fine-tune programs so they work exactly your way.

Whether you're a beginner, in-between, or an advanced programmer, our 4-part assembler package is just your speed. You'll find it's easy to learn, easy to use and more powerful. Of course, you can buy any of the programs separately. Or, for a limited time get the complete 4-part package for your 48K Apple II* with DISK II drive, at the special price of \$99.95. Look what it includes!

LISA.

This is the mainstay. It's the only interactive assembler that's so easy to use, whatever your skill level. With an average speed of 20K lines per minute, it's 4 to 20 times faster than others. Since it's a symbolic assembler, you don't have to keep track of addresses. It also provides 30 pseudo opcodes and comes with

approx. 140 pages of easy to understand, superior documentation. \$49.95.

XREF/65 - SCTOLISA - SORT 2.0.

This program handles the details like a master. XREF/65 allows you to create cross-reference listing of all variables and labels. And it helps reduce debugging and documentation time. SORT 2.0 sorts and displays the LISA symbol tables, while SCTOLISA can automatically convert SC Assembler** 3.2 files to LISA. \$19.95.

TRACE/65.

It delivers more control and reduces debugging time dramatically. Its symbolic trace listings mean you can forget wasting time looking up addresses in symbol tables. Its ability to stop listing at any time means you have sure control. And its four breakpoints let you change registers, memory locations etc. during trace. \$24.95.

DISASM/65.

This is the disassembler that's easy to use, for you, me, anyone! Because you have control and decide what code should be instruction or data. And it allows you to go in and create LISA based text files for programs where you've never seen the source code. \$29.95.

Entire 4-part package, on diskettes, complete documentation, and backed by Programma International, only \$99.95! (A \$24.85 saving.)

*Apple II is a trademark of Apple Computer, Inc.
 **SC Assembler is a trademark of S.C. Software

PROGRAMMA

Programma International, Inc.
 2908 N. Naomi Street,
 Burbank, Ca. 91504
 (213) 954-0240

✓ 277

A SOFTWARE PACKAGE YOU CANNOT AFFORD TO PASS UP

APPLE • TRS-80* LEVEL II (CASSETTE/DISK OR CP/M) • 8" CP/M** (S/D DENSITY)

WORD TYPE

A SOPHISTICATED BUT SIMPLE TO USE WORD PROCESSOR. SOME FEATURES ARE JUSTIFICATION, NEWSPAPER FORMAT, TEXT EDITING, AUTO-CENTERING, ETC.

PLUS - 100 ADDITIONAL SERIOUS PROGRAMS

BUSINESS

1. Check Book
2. Accounts Receivable
3. Accounts Payable
4. Messages
5. Label
6. Mailing List
7. Re-order
8. Long Distance
9. Inventory
10. Quarter Report
11. Daily Reports
12. Invoice
13. Overhead

HOME APPLICATIONS

1. Kitchen
2. Telephone
3. Timer
4. Inventory
5. Alarm
6. Insurance
7. Payable
8. Left Over
9. Check Book
10. Interest
11. Real Estate
12. Recipe
13. Efficiency

UTILITY PROGRAMS

1. Memory Check
2. Memory Dump
3. Debug
4. Communicate
5. System Check
6. Disable
7. Conversion
8. Move

SCIENTIFIC

1. Mean Calculations
2. Electrical Cost
3. Energy Efficiency
4. Home Efficiency
5. Solar Efficiency
6. Curve Tables
7. Alphabetic
8. Logarithms
9. Statistical Analysis
10. Measures
11. Weights
12. Circumference Points
13. Quadratic Equations
14. Straight Line
15. Conversions I
16. Conversions II
17. Conversions III
18. Conversions IV
19. Weather Forecasting
20. Hydraulic Calculations
21. Booster Calculations
22. Graphs
23. Forms

GAMES FOR ALL

1. Slot
2. Hold-Um
3. Twenty One
4. Chase It
5. OOPS
6. Wheel of Fortune
7. Craps
8. Sparkle
9. Keno

EDUCATIONAL

1. Digital Electronics
2. Integrated Circuits
3. Metric
4. Flashcards
5. Flashcards II
6. States and Capitals
7. Math I (Children)
8. Math II (Children)
9. Vocabulary
10. Digital II
11. Color Code Conversion
12. Homework I
13. Biorhythm

AMATEUR RADIO

1. Quad Antenna Design
2. Beam Antenna Design
3. L-Pad Design
4. PI-Network
5. Attenuator Design
6. Resistance
7. Capacitance
8. Coil Winding Calculations
9. Dipole Antenna Design
10. Resonance Frequency
11. DB-Loss
12. Gain Calculations
13. Frequency Calculations

ELECTRONICS

1. Ohms Law
2. OP-Amp Design
3. Circuit Analysis
4. Circuit Analysis II
5. Hex-Decimal Conversion
6. Inductance Calculation
7. Trans Formula
8. Voltage Divider

ALL FOR . . . \$109.95

Master Charge — Visa
C.O.D. — Checks Accepted

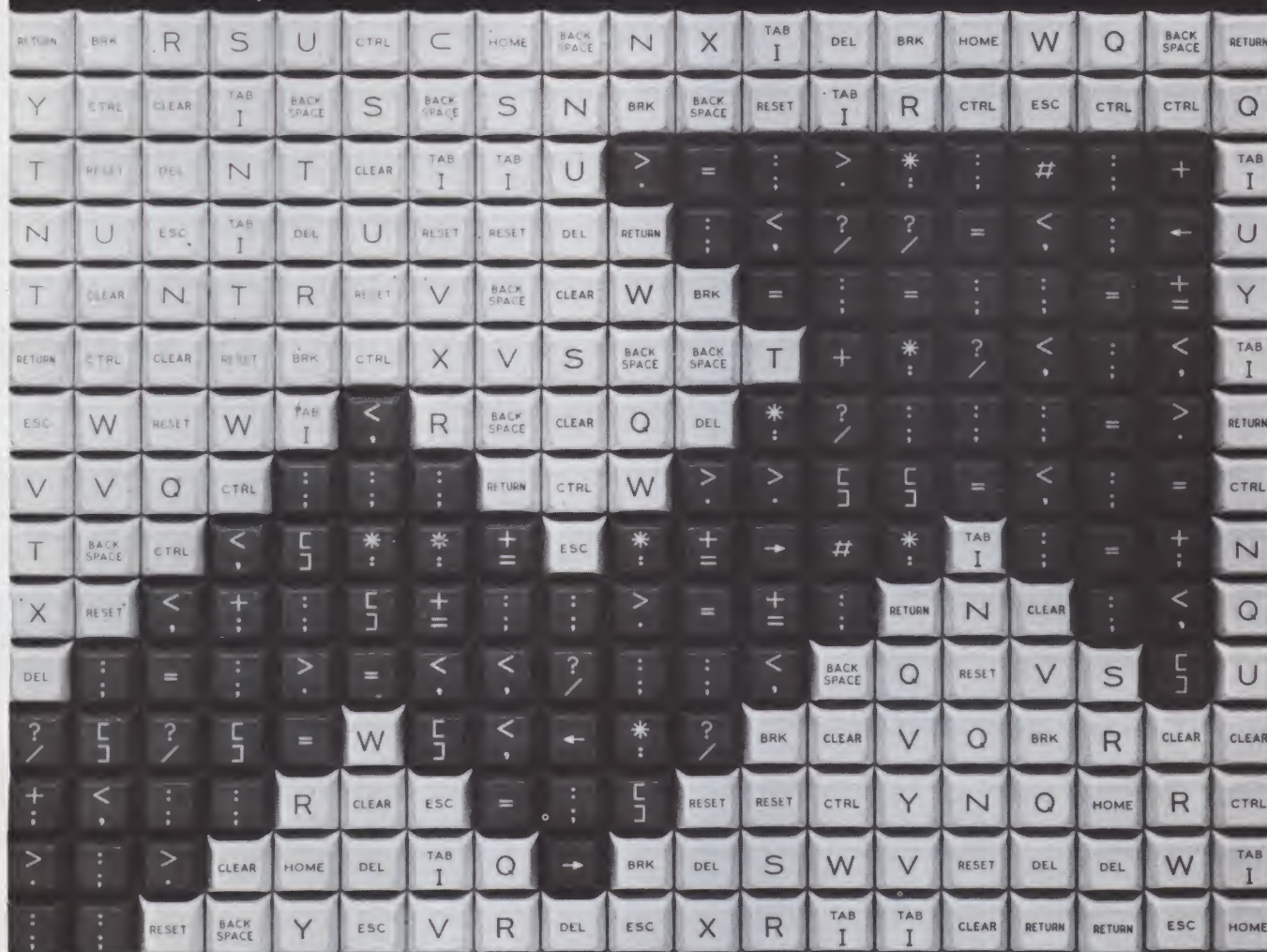
* TRS 80 - A Trademark
of Tandy Corporation

** CP/M - A Trademark
of Digital Research

HIGH SIERRA SOFTWARE INC. ✓ 340

5541 HIGHWAY 50 EAST • SUITE 2A • CARSON CITY, NEVADA 89701 • TELEPHONE (702) 883-6590

KEYS TO PRODUCTIVITY



If you plan, make, use, or buy computer systems or services, you can't afford to miss the upcoming **National Computer Conference**, McCormick Place, Chicago, May 4-7.

The theme of this year's conference is "Keys to Productivity", how to use computers and computer services to help increase output and control costs.

Come see the latest in new equipment and money-saving techniques at over 300 exhibits. Take your pick of over 100 technical sessions and 21 Professional Development Seminars. Enjoy the Personal Computing Festival, now a part of the main conference.

Save time. Save money. Pre-register now for the most dynamic NCC ever. You can:

- Avoid long registration lines
- Save \$15 on the full 4-day program
- Secure preferential housing and discount travel.

For Conference Information, call or write **National Computer Conference c/o AFIPS, P.O. Box 9658, 1815 N. Lynn Street, Arlington, VA 22209, (703) 558-3610.**

For discount air fares, airline reservations, hotel and show information, or to pre-register, call toll-free (800) 556-6882.



MAT Functions

By B. Antony Paturzo

Arrays come in handy when handling large amounts of data, especially data that can be easily tabulated. So, it's not surprising to find arrays used in a large variety of programs, from engineering to business.

What is surprising, and unfortunate, is that the BASICs available for a large number of micros do not have MAT functions, which are the BASIC array manipulators. Without these functions, the user must either oper-

ate on elements of an array one by one, or write his own MAT functions.

First, an array is a collection of items, which can be anything from profit percentages to resistor values. A one-dimensional array is called a *list* of items, or in mathematical terms, a *vector*. A two-dimensional array is called a *table*, or matrix. Since vectors and matrices both describe arrays, you can think of a vector as a special kind of matrix.

Keeping the above definitions in mind, the following example programs are intended for those using a BASIC without MAT functions.

FOR-NEXT Loops

Most of the MAT functions can be implemented using FOR-NEXT loops. Listing 1 shows how a MAT READ operation can be done. RA and CA refer to row and column, respectively, and are defined by the calling program. The DATA statements, contained elsewhere, can be written so that an RA number of DATA statements each contain a CA number of elements.

A variation of the read subroutine permits user input of the matrix elements. Listing 2 shows how you can input the matrix elements individually, a process obviously slower than using DATA statements.

A MAT PRINT is nearly identical to the MAT READ subroutine, with the replacement of READ with PRINT in line 1040. Rather than duplicate the read subroutine for MAT PRINT, Listing 3 shows how you can combine the two operations using W (for write) as the calling program selector

of either a read or print operation.

The subroutine for a MAT ADD/-SUBTRACT is shown in Listing 4, with S (for subtract) being the calling program's selection of either an add or subtract operation. The result is stored in matrix D. Note that for these two operations, matrix A must contain the same number of rows as matrix B, as well as the same number of columns as B.

Matrix multiplication is not as straightforward as addition or subtraction. This type of multiplication consists of a *row-on-column* multiplication sequence. Therefore, matrix A's number of columns must equal matrix B's number of rows. The result of the multiplication, matrix D, will be a matrix with the same number of rows as matrix A and the same number of columns as matrix B. Two cases are illustrated in Listing 5, the first where B is a vector (or one-dimensional), and the second where B is two-dimensional.

The remaining MAT functions are MAT ZER, MAT CON, MAT IDN, MAT TRN and MAT INV, and the DET function, which finds the determinant of a *square* matrix. MAT ZER and MAT CON are relatively simple operations; the former assigns all 0s to a matrix, while the latter assigns all 1s to a matrix. MAT ZER can be accomplished by replacing line 1040 of Listing 1 with "A(I,J)=0," while MAT CON replaces line 1040 with "A(I,J)=1."

MAT IDN creates an identity ma-

```
1000 REM MAT READ
1010 DIM A(RA,CA)
1020 FOR I=1 TO RA
1030 FOR J=1 TO CA
1040 READ A(I,J)
1050 NEXT J
1060 NEXT I
1070 RETURN
```

Listing 1.

```
1080 REM MAT INPUT
1090 DIM A(RA,CA)
1100 FOR I=1 TO RA
1110 PRINT "ROW ";I
1120 FOR J=1 TO CA
1130 PRINT "COLUMN ";J
1140 INPUT A(I,J)
1150 NEXT J
1160 NEXT I
1170 RETURN
```

Listing 2.

Address correspondence to B. Antony Paturzo, 1929 Trudie Drive, San Pedro, CA 90732.


```

1180 REM MAT READ/PRINT
1190 REM IF W(WRITE)=1, PRINT
1200 DIM A(RA,CA)
1210 FOR I=1 TO RA
1220 FOR J=1 TO CA
1230 IF W=1 THEN PRINT A(I,J):GOTO 1250
1240 READ A(I,J)
1250 NEXT J
1260 NEXT I
1270 RETURN

```

Listing 3.

```

1380 REM MAT MULT, B IS A VECTOR
1390 REM SU IS SUM OF MULTIPLIED ELEMENTS
1400 DIM D(RB)
1410 SU=0
1420 FOR I=1 TO RA
1430 FOR J=1 TO CA
1440 SU=SU+(A(I,J)*B(J))
1450 NEXT J
1460 D(I)=SU
1470 SU=0
1480 NEXT I
1490 RETURN

```

Listing 5a.

```

1280 REM MAT ADD/SUBTRACT
1290 REM IF S(SUBTRACT)=1, SUBTRACT
1300 DIM D(RA,CA)
1310 FOR I=1 TO RA
1320 FOR J=1 TO CA
1330 IF S=1 THEN D(I,J)=A(I,J)-B(I,J):GOTO 1350
1340 D(I,J)=A(I,J)+B(I,J)
1350 NEXT J
1360 NEXT I
1370 RETURN

```

Listing 4.

```

1500 REM MAT MULT, B IS A MATRIX
1510 DIM D(RA,CB)
1520 SU=0
1530 FOR I=1 TO RA
1540 FOR J=1 TO CB
1550 FOR K=1 TO CA
1560 SU=SU+(A(I,K)*B(K,J))
1570 NEXT K
1580 D(I,J)=SU
1590 SU=0
1600 NEXT J
1610 NEXT I
1620 RETURN

```

Listing 5b.

trix; that is, a square matrix containing all 0s, except for the elements on its main diagonal, which are all 1s. A property of the identity matrix is that if a matrix is multiplied by an identity matrix of equal dimension, the result will be the original matrix. Thus, the identity matrix behaves in matrix multiplication much like the constant 1 does in ordinary multiplication.

The simplest way to get an identity matrix is to first call MAT ZER and then the subroutine shown in Listing 6. MAT ZER will fill the matrix with all 0s, and the subroutine in Listing 6 will put 1s along the main diagonal of the matrix.

Listing 7 shows the subroutine for MAT TRN, which causes the rows and columns of a matrix to be transposed or interchanged. Matrix B is used to hold the transposed matrix; matrix A, the matrix to be transposed, is left unaltered, which lets you use both the original and the transposed matrices in any subsequent operations.

MAT INV finds the inverse of a square matrix. The product of a matrix and its inverse gives an identity matrix. The subroutine shown in Listing 8 uses *inversion-in-place*, meaning that the original matrix is replaced with its inverted form as the

```

1630 REM PUT 1S IN MAIN DIAGONAL
1640 FOR I=1 TO RA
1650 J=I
1660 A(I,J)=1
1670 NEXT I
1680 RETURN

```

Listing 6.

inversion process takes place. This method uses less memory than methods that require a temporary storage matrix. One drawback, however, is that the original matrix is lost; therefore, if the original matrix is needed for further operations, it should be saved in another matrix prior to calling MAT INV.

The subroutine for the final MAT function, the one used to find the determinant of a square matrix, is shown in Listing 9. Once again, matrix A is altered during this operation, so if you need the original matrix A for other operations, save it prior to calling the DET function. The numerical value for the determinant is returned in the variable S.

An Example

Now that you have all of the MAT

```

1690 REM MAT TRN
1700 DIM B(CA,RA)
1710 FOR I=1 TO RA
1720 FOR J=1 TO CA
1730 B(J,I)=A(I,J)
1740 NEXT J
1750 NEXT I
1760 RETURN

```

Listing 7.

functions available, a simple example will illustrate their usefulness. Suppose that you have the following set of equations:

$$2X_1 - 2X_2 + 5X_3 = 13$$

$$2X_1 + 3X_2 + 4X_3 = 20$$

$$3X_1 - 1X_2 + 3X_3 = 10$$

You would like to determine the values for X_1 , X_2 and X_3 such that all of the equations are satisfied. If you fill matrix A with the coefficients of X_1 , X_2 and X_3 so that:

$$A = \begin{bmatrix} 2 & -2 & 5 \\ 2 & 3 & 4 \\ 3 & -1 & 3 \end{bmatrix}$$

and if you fill matrix B with the right hand sides of the three equations so that:

```
13
B= 20
10
```

you can determine the values for X_1 , X_2 and X_3 by the equation $D=INV A \times B$. In other words, matrix D, which contains the numerical values for X_1 , X_2 and X_3 , can be found by taking the inverse of the matrix containing the coefficients (matrix A) and then multiplying this inverse by matrix B, which contains the right hand sides of the equations.

A program to do all of this is shown in Listing 10. Line 2130 contains a subroutine that is simply a routine to MAT READ vector B (see Listing 11).

This example could easily have been done by hand using algebra, but imagine having to solve ten simulta-

neous equations, or even 20, by hand. At that point, you'll really appreciate your MAT functions. ■

```
1770 REM MAT INV
1780 REM MAT A IS REPLACED WITH ITS INVERSE
1790 FOR K=1 TO RA
1800 FOR J=1 TO RA
1810 IF J=K GOTO 1830
1820 A(K,J)=A(K,J)/A(K,K)
1830 NEXT J
1840 A(K,K)=1/A(K,K)
1850 FOR I=1 TO RA
1860 IF I=K GOTO 1910
1870 FOR J=1 TO RA
1880 IF J=K GOTO 1900
1890 A(I,J)=A(I,J)-A(K,J)*A(I,K)
1900 NEXT J
1910 NEXT I
1920 FOR I=1 TO RA
1930 IF I=K GOTO 1950
1940 A(I,K)=-A(I,K)*A(K,K)
1950 NEXT I
1960 NEXT K
1970 RETURN
```

Listing 8.

```
1980 REM DET FUNCTION
1990 FOR I=1 TO RA-1
2000 FOR J=I+1 TO RA
2010 Q=A(J,I)/A(I,I)
2020 FOR K=1 TO RA
2030 A(J,K)=A(J,K)-(A(I,K)*Q)
2040 NEXT K
2050 NEXT J
2060 NEXT I
2070 S=1
2080 FOR I=1 TO RA
2090 S=S*A(I,I)
2100 NEXT I
2110 REM S IS VALUE FOR DETERMINANT
2120 RETURN
```

Listing 9.

SPECIAL PRICES

We offer a complete selection of hardware, software, peripherals.



OHIO SCIENTIFIC VECTOR GRAPHICS COMMODORE PET

Immediate shipping.
VISA/MC accepted

Contact us for a catalog on specific products or call us for a quote.

Computer Distributors
P.O. Box 60284 K
Houston, TX 77205
(713) 821-2702

```
10 REM SOLVE 3 SIMULTANEOUS EQUATIONS
15 REM READ MATRIX A
20 RA=3
30 CA=3
40 DATA 2,-2,5
50 DATA 2,3,4
60 DATA 3,-1,3
70 GOSUB 1000
75 REM READ VECTOR B
80 RB=3
90 DATA 13,20,10
100 GOSUB 2130
105 REM FIND INVERSE OF MATRIX A
110 GOSUB 1770
115 REM MULTIPLY INVERSE A AND VECTOR B
120 X=RB
125 PRINT
130 GOSUB 1380
135 REM OUTPUT RESULT
140 FOR I=1 TO RA
150 PRINT "X";I;"=";"D(I)
160 NEXT I
170 END
```

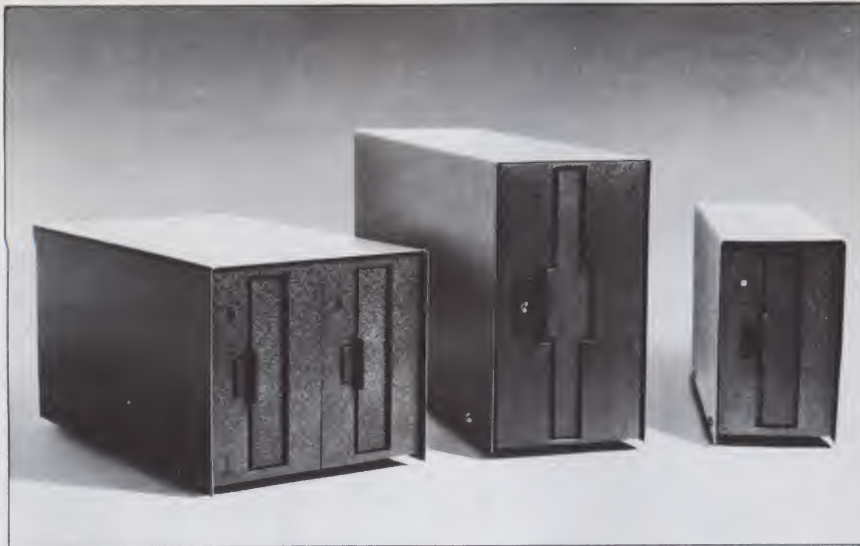
```
OK
run
```

```
X 1 = 1
X 2 = 2
X 3 = 3
```

Listing 11.

```
2130 REM READ VECTOR B
2140 DIM B(RB)
2150 FOR I=1 TO RB
2160 READ B(I)
2170 NEXT I
2180 RETURN
```

Listing 10.



More power to you.

Disk drives, hardware and software— now more affordable *and* more available!

NEW PRODUCT ANNOUNCEMENT: NEW MODEL III WITH DISK DRIVES!

TRS-80™ Model III with dual MPI B91 80-track disk drives—704K of reliable disk storage on only two drives!

This system features:

- Two MPI B91 double-density 80 track drives
- 48K RAM, double-density Newdos 80
- 3 millisecond access time
- Includes A.M. Electronics' controller board and MAKE80® program
- Complete, ready-to-run

Special Introductory Price **\$2295**

The Ultimate Small Business Computer: TRS-80™ Model III with four dual-headed MPI B92 80-track disk drives!

This system features:

- Four proven MPI drives
- 48K RAM, double-density Newdos 80
- 3 millisecond access time
- 2.8 Megabytes reliable disk storage
- Includes A.M. Electronics' MAKE80® program and controller board
- Complete, ready-to-run

Special Introductory Price **\$3795**

CASES AND POWER SUPPLIES

5½-Inch enclosures

Single drive unit case and power supply **\$85**

Dual drive unit case and power supply **\$120**

(Extender cables are \$15 each extra)

8-inch enclosures

Single drive unit case and power supply **\$150**

Store Hours: Tues. - Fri. 11-7, Sat. 11-5.

Complete Service Center: For speedy repairs, including modified TRS-80's.

Attention dealers, OEM's & distributors
Call us for details on our attractive pricing.

SPECIALS!

SAVE ON COMPLETE DISK DRIVES!

5¼-inch drives

40-track MPI 51 w/case, power supply and extender cable . . . **\$320**

80-track MPI 91 w/case, power supply and extender cable . . . **\$425**

Dual-headed 80-track drive with case and power supply **\$550**

8-inch drives

Single Siemens 8-inch drive with dual case and power supply . . **\$695**

INTRODUCING TEAC DISK DRIVES—THE BEST DRIVES WE HAVE SEEN TO DATE!

Teac 40-track disk drive **\$299**

Teac 80-track disk drive **\$399**

All drives complete with cases, power supplies and extender cables.

(Add \$20 for "Flippy" version)

PRINTER SPECIAL!

Epson MX-80 Printer **\$495**

TRS-80™ SOFTWARE PACKAGES

MAKE80®

Converts standard 35 or 40 track diskettes into 80-track-readable diskettes . . . **\$14.95**

The power behind
the drives®

✓ 39



A.M. ELECTRONICS, INC.
3366 Washtenaw Ave.
Ann Arbor, Michigan 48104
(313) 973-2312

Visit our retail showroom for a "hands-on" look at our TRS-80™ hardware and software

SUPER UTILITY, by Kim Watt.

Stand-alone 24K machine language program for disk includes:

ZAP UTILITY

- Read/modify data regardless of disk protection • One-step track-to-track/sector to sector • Dual cursors; ASCII and Hex. Modify in Hex, Decimal or ASCII • Display disk sectors, display file sectors, copy disk sectors, compare disk sectors, display/modify main memory, search memory or disk for specified string and return location

PURGE UTILITY

- Kill files by file spec or category • Zero out unused directories or sectors
- Compute passwords, change disk's name, date, passwords, protection levels • Directory routine indicates all active and inactive files, their location in directory and status of granules

DISK COPY UTILITY

- Copy any TRS-80™ readable disk, regardless of protection

TAPE COPY UTILITY

- Copy any TRS-80™ readable tape, regardless of protection or baud rate

DISK REPAIR UTILITY

- Automatically repair damaged HIT, GAT or BOOT sectors • Directory check advises of errors • Automatic recovery of killed files • Shows active and inactive files, and their location on the disk

MEMORY UTILITY

- Move memory • Jump to memory • Test memory • Compare memory • Input or output any byte to any port • Zero memory • Exchange memory • Edit memory • Load memory

SUPER UTILITY is now available for **\$49.95**, plus \$2.50 shipping and handling!

*TRS-80 is a trademark of Tandy Corp.





THE NATIONAL COMPUTER SHOWS HAVE WE GOT A PROGRAM FOR YOU IN '81

Attend the biggest public computer shows in the country. Each show has 100,000 square feet of display space featuring over 50 Million Dollars worth of software and hardware for business, industry, government, education, home and personal use.

You'll see computers costing \$150 to \$250,000 including mini and micro computers, software, graphics, data and word processing equipment, telecommunications, office machines, electronic typewriters, peripheral equipment, supplies and computer services.

All the major names are there including; IBM, Wang, DEC, Xerox, Burroughs, Data General, Qantel, Nixdorf, NEC, Radio Shack, Heathkit, Apple, RCA, Vector Graphic, and Commodore Pet. Plus, computerized video games, robots, computer art, electronic gadgetry, and computer music to entertain, enthrall and educate kids, spouses and people who don't know a program from a memory disk.

Don't miss the Coming Of The New Computers—Show Up For The Show that mixes business with pleasure. Admission is \$5 for adults and \$2 for children under 12 when accompanied by an adult.

Ticket Information

Send \$5 per person with the name of the show you will attend to National Computer Shows, 824 Boylston Street, Chestnut Hill, Mass. 02167
Tel. 617 739 2000.

Tickets can also be purchased at the show.

THE SOUTHWEST COMPUTER SHOW

DALLAS

Dallas Market Hall
2200 STEMMONS FRWY
AT INDUSTRIAL BLVD
APRIL 9-12
10 AM TO 7 PM
THURS-SUN

THE MID-WEST COMPUTER SHOW

CHICAGO

McCormick Place
SCHOESSLING HALL
23RD & THE LAKE
SEPTEMBER 10-13
10 AM TO 7 PM
THURS-SUN

THE MID-ATLANTIC COMPUTER SHOW

WASHINGTON, DC **DC Armory/Starplex**

2001 E. CAPITOL ST. SE
(E CAP ST EXIT OFF I295
— KENILWORTH FRWY)
ACROSS FROM RFK STADIUM
SEPTEMBER 24-27
10 AM TO 7 PM
THURS-SUN

THE NORTHEAST COMPUTER SHOW

BOSTON

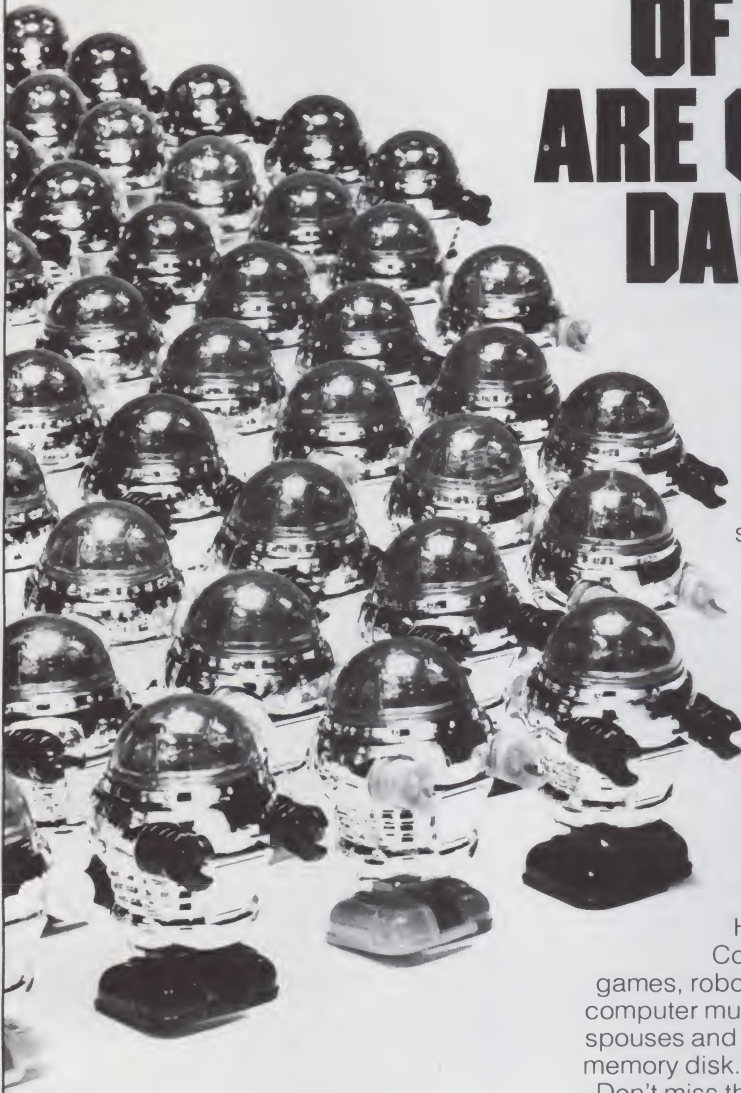
Hynes Auditorium
PRUDENTIAL CENTER
OCTOBER 15-18
10 AM TO 7 PM
THURS-SUN

THE SOUTHEAST COMPUTER SHOW

ATLANTA

Atlanta Civic Center
395 PIEDMONT AVE NE AT
RALPH MCGILL BLVD
OCTOBER 29-NOVEMBER 1
10 AM TO 7 PM
THURS-SUN

THOUSANDS OF COMPUTERS ARE GATHERING IN DALLAS AGAIN.



The biggest and most exciting public computer show ever to be in the Dallas area is ready to take place. Make sure you take it in. The show has 100,000 square feet of display space featuring over 50 Million Dollars worth of software and hardware for business, industry, government, education, home and personal use.

You'll see computers costing \$150 to \$250,000, including mini and micro computers, software, graphics, data and word processing equipment, telecommunications, office machines, electronic typewriters, peripheral equipment, supplies and services.

All the major names are there including; IBM, Wang, Burroughs, DEC, Data General, Qantel, Nixdorf, Xerox, NEC, Radio Shack, Heathkit, Apple, RCA, Vector Graphic and Commodore Pet. Plus computerized video games, robots, computer art, electronic gadgetry and computer music to entertain, enthrall and educate kids, spouses and people who don't know a program from a memory disk.

Don't miss the Coming Of The New Computers - Show Up For The Show that mixes business with pleasure. Admission is \$5 for adults and \$2 for children under 12 when accompanied by an adult.

DALLAS
Dallas Market Hall
2200 STEMMONS FRWY
AT INDUSTRIAL BLVD
APRIL 9-12
10 AM TO 7 PM
THURS-SUN

**THE
SOUTHWEST
COMPUTER
SHOW
AND
OFFICE
EQUIPMENT
EXPOSITION**

One of the five 1981 National Computer Shows produced by Northeast Expositions
824 Boylston Street, Chestnut Hill, Mass. 02167. Tel. 617 739- 2000

PET Shorthand Compleat

By Gary L. Ratliff

The idea of shorthand is nothing new to old-time computer users. My first exposure to computer programming 15 years ago was through a book that introduced a 24-bit code. All the coding was in binary, which was tedious to use. Hexadecimal and octal are used as shorthand for the more cumbersome binary. Assembly-language programming is still a further approach that makes the operation codes of the computer more meaningful for human users.

Shorthand is an integral part of some high-level languages and an added feature of several of the BASIC-speaking computers for the home user, "personal computer" market. APL has a number of its functions available with a single key-stroke. FORTH offers the user the ability to virtually define his program using as short a "word" as he desires. The Bally Arcade offers its BASIC with all keywords available at a single stroke of one key. The shorthand of the Level I TRS-80 is useful and well documented in the user's manual. The shorthand is no longer available once the owner upgrades to the more versatile Level II system.

That the Commodore PET also has available a shorthand that may be used either within a program or in the direct mode is not so well known. Its presence was mentioned in an ear-

ly issue of *Cursor*, the cassette magazine for PET users. The purpose of this article is to expand on that original idea and explain its use and its limitations.

PET's Secret Code

The idea is very simple. Most keywords in PET BASIC may be obtained by entering the first letter of the word followed by the shifted second letter of the word. Since the shifted graphic characters are difficult to reproduce, the tables and the examples presented assume that the user has set his computer in the lowercase alphabetic mode. This is done by entering the direct statement: POKE% (\$*,!\$. This is exactly what the screen of your PET may look like using shorthand if you fail to change modes. By changing modes this becomes readable: POKE 59468, 14. Now the second letter of the keyword shifted appears to be a lowercase letter.

Just a little thought and some time spent in constructing an alphabetic list of the PET keywords will clearly reveal why this method won't work for all keywords. The most obvious fact is that many of the keywords are only two bytes anyway. Therefore, even if this method works for them, there is nothing to gain by using this method on words only two letters long.

The next exception is obviously keywords that begin with the same

first two letters, for example, STOP, STEP, STR\$ or INPUT, INPUT#, INT. Many of these exceptions may still be successfully converted into shorthand by differentiating them on the third letter. St is shorthand for STOP; while the three letter code StE gives STEP and STR gives STR\$. Table 1 shows a list of PET BASIC keywords and their shortened versions.

Now that we are equipped with a table of values to convert programs into this shorthand, let's test our new knowledge by trying a short example:

```
10 OPEN 1,1,1,"DATA"
20 FOR I=1 TO 25
30 PRINT#1,I
40 PRINT I
50 NEXT
60 CLOSE1
70 PRINT "DONE";TAB(15)"STOP"
80 END
```

Using the multiline feature of the Microsoft BASICs and the PET shorthand feature, this entire program may be entered as a one-liner as follows:

```
50p1,1,1,"DATA":FoI=1TO25:Pr1,I:Ta1:Ne:CL
o1:?"DONE";Ta15)"STOP":En
```

Before running this program, remove your cassette tape from your tape drive. The program creates a file called DATA which contains the first positive integers from 1 to 25. If you have a tape containing several programs and you run this program, it will create this file on top of your program tape. If this was a commercial

Gary L. Ratliff, 101 East St., Mendenhall, MS 39114.

program for which you paid several dollars, you would not be happy to have the program destroy one of your tapes.

Now type Ru and hit return. You will read the numbers on the screen and hear the cassette motor turn on and then off. Now type Li and hit return. Notice that the shorthand you entered has been expanded to the full PET keywords.

One of the principle uses for this shorthand is the effective lengthening of the BASIC input buffer. This buffer is 80 bytes or two screen lines. If the full text of the keywords is typed, then maximum use of a line cannot be realized. By using shorthand the fact that user-defined functions may only be one line in length may be reduced. Therefore, with shorthand, more involved user functions may be created.

To demonstrate how the buffer is lengthened, let us consider another example. The following is a one-line direct statement that will give an ASCII dump of the variables contained within a BASIC program:

```
FORI=256*PEEK(125)+PEEK(124)TO256*P
EEK(127)+PEEK(126)STEP7:PRINTPEEK(I);P
EEK(I+1):NEXT
```

This statement is 86 bytes. Even using the ? for PRINT will only reduce it to 82 bytes. But with PET shorthand it is only 66 bytes. Now the statements will work as a direct statement and the extra luxury of 14 bytes even allows us to include a timing loop to slow down the listing:

```
FoI=256*Pe(125)+Pe(124)TO256*Pe(127)+P
e(126)STe7:Pe(I);Pe(I+1):FoJ=1TO999:Ne:Ne
```

By the use of shorthand in this example, we have created a direct statement 103 bytes in length. This means that we have effectively increased the input buffer by 28.75 percent.

One additional technique that may prove of value to persons who want to design complex functions through the use of the user-defined function feature is spoon-feeding the line into the program. The user-defined function should be the first line entered. The line is translated into its token symbols and its numerical ASCII values. (Jim Butterfield's tables (see References) make this task much easier.)

Next, these token values are directly poked into the program via direct statements. Be sure to follow the end of the line with an additional poking of two zeros. This is to signal the BASIC interpreter that there are no further lines to follow. Failure to do this

Key	Short	Key	Short	Key	Short
ABS	Ab	INPUT#	In	READ	Re
AND	An	INPUT	N/A	RESTORE	REs
ASC	As	INT	N/A	RETURN	REt
ATN	At			RIGHT\$	Ri
		LEN	N/A	RND	Rn
CHR\$	Ch	LET	Le	RUN	Ru
CLOSE	CLo	LEFT\$	LEf		
CLR	Cl	LIST	Li	SAVE	Sa
CMD	Cm	LOAD	Lo	SGN	Sg
CONT	Co	LOG	N/A	SIN	Si
COS	N/A			SPC	Sp
		MID\$	Mi	SQR	Sq
DATA	Da			STOP	St
DEF	De	NEXT	Ne	STEP	STe
DIM	Di	NEW	N/A	STR\$	STr
		NOT	No		
END	En			TAB	Ta
EXP	Ex	ON	N/A	TAN	N/A
		OR	N/A	THEN	Th
FOR	Fo	OPEN	Op	TO	N/A
FRE	Fr				
		PEEK	Pe	USR	Us
GET	Ge	POKE	Po		
GET#	N/A	POS	N/A	VAL	Va
GOTO	Go	PRINT#	Pr	VERIFY	Ve
GOSUB	GOs	PRINT	?		
				WAIT	Wa
IF	N/A	REM	N/A		

Notes: Both TAB and SPC have the leftmost parentheses included when this shorthand is used. Therefore, PRINT TAB (15);"ACCT.NO." should be coded using this method: ?Ta15);"ACCT.NO."

CONT is only usable as a command, and, if used within a program, it gives an error condition which must be removed.

Table 1. PET BASIC keywords and their shortened versions.

step will result in a system crash in most cases. Now list, and you should see this line as the first and only line of the program text. The rest of the program may be entered using the more conventional keyboard entry of the text.

To demonstrate this method without giving a specific example, it is suggested that if the reader has access to the Mike Stone article on program overlays, which was reprinted in the *PET Gazette*, he try using the direct POKE technique with the program listed in the article. The linking and translation of the token symbols and ASCII values is already done. The correct start for this example is:

```
POKE1025,11:POKE1026,4:POKE1027,10:PO
KE1028,0:POKE1028,65 etc.
```

Advantages

1. There is a lesser chance of error as less material must be typed. If you examine all your key-in errors you will probably find that most of them occur closer toward the end of the word.

2. Expands the range of the line by

allowing more lines to be used with the multiline feature already in this machine.

3. Shorter keywords should mean that once the technique is learned it should be possible to enter your programs faster.

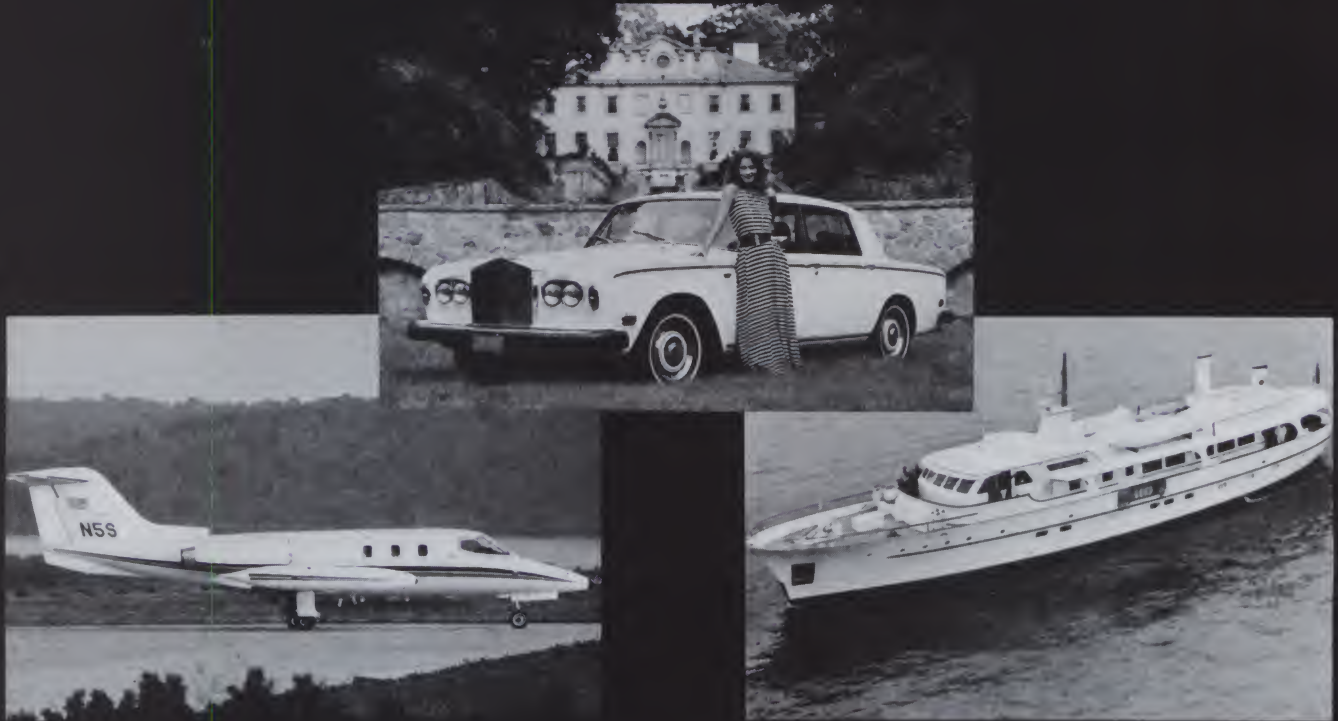
4. More complex user-defined functions and direct statements. (The usefulness of direct statements in debugging may be enhanced by including debugging routines within the text of the program. Then these tests may be performed from the keyboard by a direct command GOsX, where X is the line number of the debugging routine. However, none of these subroutines should call on the INPUT function.)

Disadvantage

The main weakness of using PET shorthand is that lines that expand to more than 80 bytes may not be edited with the screen editor. The longest possible line with PET BASIC will list out at 242 bytes. This line would consist of a line number and ?:. A one-digit line number would allow the

Hundreds of Rolls Royces, Yachts, Airplanes & Premium Properties

THE ROBB REPORT



THE ROBB REPORT, published monthly, is the market place for the buyer, seller and trader who appreciates the finer things in life. Listed for sale are hundreds of new and previously owned antique and classic motor cars, yachts, airplanes, premium properties horses, art, firearms and antique treasures. Complete descriptions and photographs are included, as well as the owner's name, address and telephone number.

A 12 month subscription to THE ROBB REPORT is \$45.00*. Send your check to the address below. For even faster 24 hour service, call toll-free: 800-228-2606. (In Nebraska call 800-642-8777). For renewals or information call 404-256-9470.

The
Robb Report
THE MAGAZINE FOR CONNOISSEURS

✓ 20

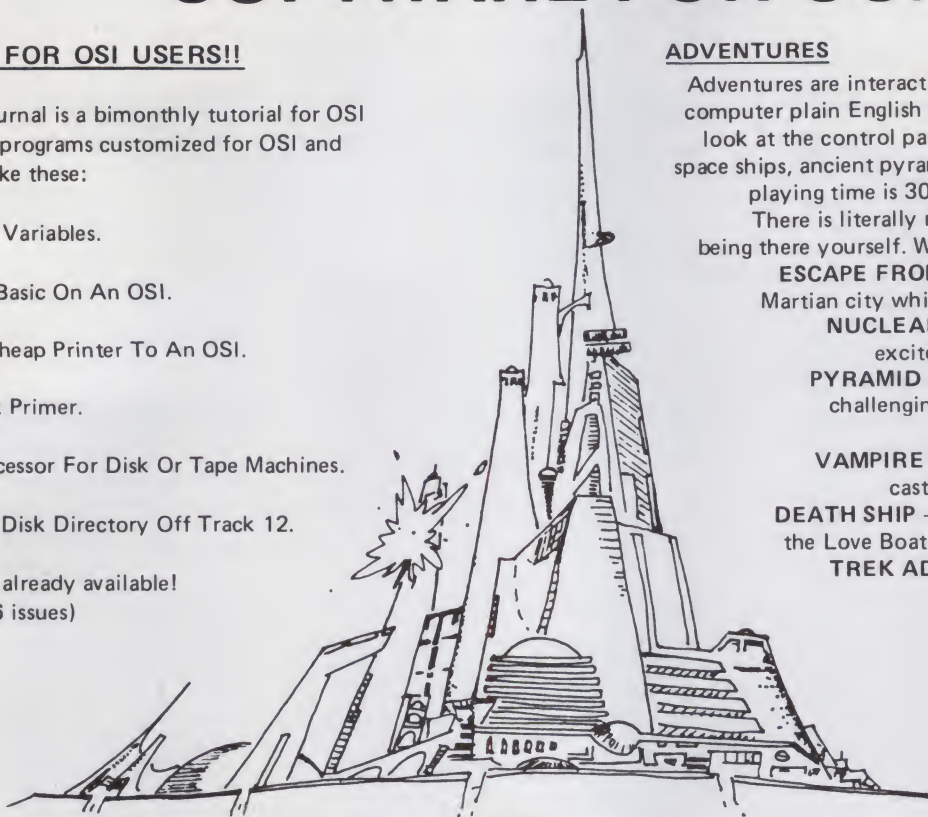
THE ROBB REPORT/P.O. Box 720317/Atlanta, Georgia 30328

A JOURNAL FOR OSI USERS!!

The Aardvark Journal is a bimonthly tutorial for OSI users. It features programs customized for OSI and has run articles like these:

- 1) Using String Variables.
- 2) High Speed Basic On An OSI.
- 3) Hooking a Cheap Printer To An OSI.
- 4) An OSI Disk Primer.
- 5) A Word Processor For Disk Or Tape Machines.
- 6) Moving The Disk Directory Off Track 12.

Four back issues already available!
\$9.00 per year (6 issues)

ADVENTURES

Adventures are interactive fantasies where you give the computer plain English commands (i.e. take the sword, look at the control panel.) as you explore alien cities, space ships, ancient pyramids and sunken subs. Average playing time is 30 to 40 hours in several sessions. There is literally nothing else like them — except being there yourself. We have six adventures available.

ESCAPE FROM MARS — Explore an ancient Martian city while you prepare for your escape.

NUCLEAR SUBMARINE — Fast moving excitement at the bottom of the sea.

PYRAMID — Our most advanced and most challenging adventure. Takes place in our own special ancient pyramid.

VAMPIRE CASTLE — A day in old Drac's castle. But it's getting dark outside.

DEATH SHIP — It's a cruise ship — but it ain't the Love Boat and survival is far from certain.

TREK ADVENTURE — Takes place on a familiar starship. Almost as good as being there.

\$14.95 each

NEW SUPPORT ROMS FOR BASIC IN ROM MACHINES

C1S — for the C1P only, this ROM adds full screen edit functions (insert, delete, change characters in a basic line.), Software selectable scroll windows, two instant screen clears (scroll window only and full screen.), software choice of OSI or standard keyboard format, Bell support, 600 Baud cassette support, and a few other features. It plugs in in place of the OSI ROM. NOTE: this ROM also supports video conversions for 24, 32, 48, or 64 characters per line. All that and it sells for a measly \$39.95.

C1E/C2E for C1/C2/C4/C8 Basic in ROM machines.

This ROM adds full screen editing, software selectable scroll windows, keyboard correction (software selectable), and contains an extended machine code monitor. It has breakpoint utilities, machine code load and save, block memory move and hex dump utilities. A must for the machine code programmer replaces OSI support ROM. Specify system \$59.95

DISK UTILITIES

SUPER COPY — Single Disk Copier

This copy program makes multiple copies, copies track zero, and copies all the tracks that your memory can hold at one time — up to 12 tracks at a pass. It's almost as fast as dual disk copying. — \$15.95

MAXIPROSS (WORD PROCESSOR) — 65D polled keyboard only - has global and line edit, right and left margin justification, imbedded margin commands, choice of single, double or triple spacing, file access capabilities and all the features of a major word processor — and it's only \$39.95.

P.C. BOARDS

MEMORY BOARDS!! — for the C1P. — and they contain parallel ports!

Aardvarks new memory board supports 8K of 2114's and has provision for a PIA to give a parallel ports! It sells as a bare board for \$29.95. When assembled, the board plugs into the expansion connector on the 600 board. Available now!

PROM BURNER FOR THE C1P — Burns single supply 2716's. Bare board — \$24.95.

MOTHER BOARD — Expand your expansion connector from one to five connectors or use it to adapt our C1P boards to your C4/8P. — \$14.95.

ARCADE AND VIDEO GAMES

ALIEN INVADERS with machine code moves — for fast action. This is our best invaders yet. The disk version is so fast that we had to add selectable speeds to make it playable.
Tape - \$10.95 — Disk - \$12.95

TIME TREK (8K) — real time Startrek action. See your torpedoes move across the screen! Real graphics — no more scrolling displays. \$9.95

STARFIGHTER — a real time space war where you face cruisers, battleships and fighters using a variety of weapons. Your screen contains working instrumentation and a real time display of the alien ships. \$6.95 in black and white - \$7.95 in color and sound.

MINOS — A game with amazing 3D graphics. You see a maze from the top, the screen blanks, and then you are in the maze at ground level, finding your way through on foot. Realistic enough to cause claustrophobia. — \$12.95

SCREEN EDITORS

These programs all allow the editing of basic lines. All assume that you are using the standard OSI video display and polled keyboard.

C1P CURSOR CONTROL — A program that uses no RAM normally available to the system. (We hid it in unused space on page 2). It provides real backspace, insert, delete and replace functions and an optional instant screen clear. \$11.95

C2/4 CURSOR. This one uses 366 BYTES of RAM to provide a full screen editor. Edit and change lines on any part of the screen. (Basic in ROM systems only.)

FOR DISK SYSTEMS — (65D, polled keyboard and standard video only.)

SUPERDISK. Contains a basic text editor with functions similar to the above programs and also contains a renumberer, variable table maker, search and new BEXEC* programs. The BEXEC* provides a directory, create, delete, and change utilities on one track and is worth having by itself. — \$24.95 on 5" disk - \$26.95 on 8".

AARDVARK IS NOW AN OSI DEALER!

Now you can buy from people who can support your machine.

—THIS MONTH'S SPECIALS—

Superboard II	\$279
C1P Model II	429
C4P	749

... and we'll include a free Text Editor Tape with each machine!

Video Modification Plans and P.C. Boards for C1P as low as \$4.95

This is only a partial listing of what we have to offer. We now offer over 100 programs, data sheets, ROMs, and boards for OSI systems. Our \$1.00 catalog lists it all and contains free program listings and programming hints to boot.



CALENDAR

Computer Contest

A national computer problem-solving contest, open to junior-high and high-school students, will be held May 2, 1981. Schools and organizations interested in participating in this contest, which is sponsored by the University of Wisconsin—Parkside, should contact Dr. Donald T. Piele, Associate Professor of Mathematics, University of Wisconsin—Parkside, Kenosha, WI 53141, by April 4.

Executive Computer Conference

The Executive Computer Conference, sponsored by *Infosystems*, will be held April 13–14, 1981, in Washington, D.C. It will focus on key aspects of the computer's contribution to organizational productivity from a senior management perspective. For further information, contact the conference chairman, Kendall Burroughs, The Executive Computer Conference, 1730 North Lynn St., Suite 400, Arlington, VA 22209, 703/521-6209.

Micros and Education

Microcomputers and Education Second Annual Tri-state Conference, sponsored by the Center for the Advancement of Teaching and Learning (CATALYST), will be held at the Jersey City State College on March 6 and 7, 1981. The conference, which will feature speakers, workshops and exhibits, will examine the uses of microcomputers in the school and college curriculum and ways to improve computer literacy at all levels of education. For more information, contact CATALYST, Microcomputer Conference, Jersey City State College, 2039 Kennedy Boulevard, Jersey City, NJ 07305, 201/547-3094 or 3098.

College Symposium

The 14th Annual Small College Computing Symposium will take place March 13–14, 1981, at Augustana College. For further information, contact Joseph Pagone, director of Computer Science Education, Augustana College, Sioux Falls, SD 57197.

use of 40 ?s and 39 :s. To list this on the screen will take just over six lines of the screen.

One method to avoid this difficulty is to start entering a line mid screen. Now when listing the line your shorthand version will not scroll off the top of the screen. If you now find an error, it will be possible to correct it in the shorthand version of the text on the screen. ■

References

Dr. David A. Lien: *Users Manual Level I*, 1977, Radio Shack, Fort Worth, TX.

Leonard Gilman and Allen J. Rose, *APL, An Interactive Approach*, 1974, John Wiley and Sons, New York.

Notes to *Cursor* No. 2, August 1978, Ron Jeffries Publisher, Goleta, CA. Mike Stone, "Program Overlays," *PET Gazette*, Vol. 1, No. 6.

PET User Manual, 1978, Commodore Business Machines, Palo Alto CA.

Jim Butterfield, *PET Gazette*, Spring 1979.

Gary Ratliff, "Just Poking Around With My PET," *Dr. Dobb's Journal* *PET User Manual*, 1978, Commodore Business Machines, Palo Alto, CA.

DR. DALEY presents Software for the PET and the APPLE

Dr. Daley's software is proud to announce the release of a package of our best selling programs.

These programs, regularly retailing for over \$400, have been assembled into a single

package for only \$69.95* Included is our best selling TREK3, CHECKBOOK, and a mailing list, tutorials, games and puzzles for every member of the family. All attractively packaged in an album.

50 PROGRAMS ONLY \$69.95

*Disk version \$10 extra.



Charge your order to
MC/VISA



Your order will be shipped within four business days from receipt.

DR. DALEY, 425 Grove Avenue, Berrien Springs, Michigan 49103

✓ 88

Phone (616) 471-5514 Sun. thru Thurs., noon to 9 p.m. eastern time.

SIRIUS 8000 and 80 + HIGH PERFORMANCE, LOW COST FLOPPY ADD-ONS!

The SIRIUS SYSTEMS 8000 and 80 + Series of Floppy Disk Add-Ons are designed to provide unmatched versatility and performance for your TRS-80* MOD I and MOD II.

80 + FOR YOUR MOD I—

COMMON CHARACTERISTICS include
■ SINGLE/DOUBLE Density Operation
■ 90 Days P&L WARRANTY ■ Mix any or all 80 + on the SS Standard Cable
■ Exceptional Speed Stability ■ 5ms track-to-track access time (25ms for the 80 + 5) ■ Switch Selectable Drive Address

The SIRIUS 80 + 5 is a SINGLE SIDED, 40 TRACK Disk Drive with 102K/204K Bytes Single/Double Density Operation. **SPECIAL INTRODUCTORY PRICE!!**

SIRIUS 80 + 5.....\$299.95

SIRIUS 80 + 5A

(with Floppy-Disk Option).....\$314.95
SIRIUS 80 + 1—a SINGLE SIDED, Fast 40 TRACK Disk Drive with 102/204K Bytes Single/Double Density Operation.

SIRIUS 80 + 1.....\$349.95
SIRIUS 80 + 2—a DOUBLE SIDED, 80 TRACK (40/side) Disk Drive. It appears to the TRS-80* as TWO 40 TRACK drives yet COST LESS THAN HALF THE PRICE! This unit may require the SS Standard Cable. Formatted data storage is 204K/408K Bytes Single/Double Density.

SIRIUS 80 + 2.....\$429.95



SIRIUS 80 + 3—a SINGLE SIDED, 80 Track (96 tpi) Disk Drive, Offering 2 1/3 times the storage of a standard Radio Shack Drive (204/408K Bytes Single/Double Density), the 80 + 3 reduces the need for diskettes tremendously!!

SIRIUS 80 + 3.....\$479.95

SIRIUS 80 + 4—a DOUBLE SIDED, 160 track (80/side-96 tpi) Disk Drive. The ultimate in State-Of-The-Art 5 1/4" Floppy Disk Technology, the 80 + 4 is seen by the TRS-80* as TWO single sided drives. Thus, in terms of capacity, one 80 + 4 is equivalent to 4 2/3 standard Radio Shack drives—at a savings of over 73%. (With a Double Density Converter, the available memory is huge—408K/916K Bytes Single/Double Density!!)

SIRIUS 80 + 4.....\$629.95

Note: The Expansion Interface limits drives to 12ms track-to-track *TRS-80 of Tandy Corp.

ACCESSORIES

SS Standard 2 Drive Cable.....\$29.95

5 1/4" Diskettes (Box of 10).....\$29.95

NEWDOS/80-Sophisticated Operating System for the TRS-80* from

Apparat.....\$139.95

Save up to 10% with these SIRIUS Packages!

SIRIUS 80 + 5, NEWDOS/80, and Two Drive Cable.....\$429.95

SIRIUS 80 + 3, NEWDOS/80, and Two Drive Cable.....\$624.95

SIRIUS 80 + 4, NEWDOS/80, and Two Drive Cable.....\$749.95

TWO SIRIUS 80 + 5's (SPECIAL INTRODUCTORY PRICE!!).....2 for \$599.95

TWO SIRIUS 80 + 3's, NEWDOS/80, and Two Drive Cable.....\$959.95

TWO SIRIUS 80 + 4's, NEWDOS/80, and Two Drive Cable.....\$1349.95

FOR YOUR MOD II—SIRIUS 8000 (NEW!!)

(All SIRIUS 8000 Series 8" Floppy Disk Drives include Case and Power Supply.)

SIRIUS 8000—SINGLE SIDED, 77 TRACK 8" Disk Drive.....\$649.95

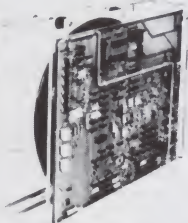
SIRIUS 8500—DOUBLE SIDED, 154 TRACK 8" Disk Drive.....\$829.95

SIRIUS 8100—2 DRIVE, SINGLE SIDED Expansion System.....\$995.95

SIRIUS 8150—2 DRIVE, DOUBLE SIDED Expansion System.....\$1360.95

2 Drive, 50 Conductor Cable for MOD II.....\$44.95

PRIAM Hard Disks Now Available from SIRIUS SYSTEMS!



PRIAM's high-performance, low-cost Winchester disc drives speed up throughput and expand data storage from 20 megabytes to 154 megabytes. And a single controller can be used to operate 14-inch-disc drives with capacities of 33, 66, or 154 megabytes or floppy-disc-size drives holding 20 and 34 megabytes. So it's easy to move up in capacity, or reduce package size, without changing important system elements or performance.

- Fast, Linear Voice Coil Positioning
- 10 ms track-to-track positioning
- Fully servoed head positioning
- Dedicated servo tracks
- DC Power required only!
- Simple, parallel Interface
- Optional SMD Interface
- 50 ms Average Positioning time
- 90 ms Maximum Positioning Time
- 6.4 ms Average Latency

THE PRIAM LINEUP

Model/Disc Size	Capacity	Size	Weight	Price
DISKOS 2250 (14")	22Mbytes	7" x 17" x 20"	33lbs.	\$2495
DISKOS 3350 (14")	33Mbytes	7" x 17" x 20"	33 lbs.	\$2995
DISKOS 6650 (14")	66 Mbytes	7" x 17" x 20"	33 lbs.	\$3749
DISKOS 15450 (14")	154 Mbytes	7" x 17" x 20"	33 lbs.	\$4695
DISKOS 2050 (8")	20 Mbytes	4.62" x 8.55" x 14.25"	20 lbs.	\$2995
DISKOS 3450 (8")	34 Mbytes	4.62" x 8.55" x 14.25"	20 lbs.	\$3745
DISKOS 1070	10.6 Mbytes	floppy-size	(low)	\$2195

Optional SMD interface available for \$150.

SIRIUS SYSTEMS Hard Disk Enclosures include all internal cabling, a power supply, case and a fan for reliable operation.

14" DISKOS DRIVE CASE.....\$375.00

8" DISKOS DRIVE CASE.....\$265.00

Introducing the Versatile, Low-Cost OMEGA Series Controller

As new technological advances bring down the cost of fast, reliable mass data storage, the need for an inexpensive, versatile controller have become greater and greater. To meet this need, SIRIUS SYSTEMS' OMEGA Series Controller was designed.

The SIRIUS OMEGA Series Controller Module utilizes an on-board microprocessor to mediate data transfer to a wide variety of peripherals from an equally wide variety of host computer systems. Up to four Winchester Hard Disks (8" or 14"), four 5 1/4" Floppy Disk Drives and/or up to eight 8" Floppy Disk Drives may be in use at one time.

SPECIFIC HARDWARE

FEATURES INCLUDE:

- Control of up to twelve Floppy Disk Drives (eight 8" and/or four 5 1/4")
- 8" and/or 5 1/4" Disk Drive Utilization
- Single (FM) or Double (MF) density data storage
- Hard or Soft sectored diskette usage

- Utilization of "Quad" density (96 tpi) 8" or 5 1/4" Disk Drives

- Control of up to four WINCHESTER type PRIAM DISKOS Disk Drives
- 8" or 14" may intermix on the same cable
- Accommodates 8" and/or 14" drives of 10.6 Mbytes to 154 Mbytes
- Ultra-Fast data transfers
- Extremely flexible host-controller interfacing

SPECIFIC SOFTWARE

FEATURES INCLUDE:

- Dynamic format modifications via command words
- Extremely flexible format acceptance for unusual data storage formats
- Easily interfaces to standard operating systems (TRS-DOS*, CP/M*, etc.)
- Operates in either get/put sector mode or data string mode
- Performance parameters may be changed by EPROM replacement or Dynamic Reprogramming

CP/M™ of Digital Research

THE OMEGA-S100—a DMA, Single Board controller available in Hard Disk, Floppy Disk and Combinational Versions.

OMEGA-S100 FDC (Floppy Disk only version).....\$495.95

OMEGA-S100 HDC (Hard Disk only version).....\$725.95

OMEGA-S100 FHDC (Floppy and Hard Disk version).....\$795.95

THE TRS-80* MOD II OMEGA—a Single Board, DMA Hard Disk Controller for the Radio Shack MOD II.....\$725.95

THE LSI-II OMEGA—a DMA, Single Board (quad width), DEC compatible Hard Disk controller for Q-BUS type computers (LSI-11/2 and LSI-11/23 compatible). OMEGA-LSI 11.....\$1395.00

NOTE: OMEGA Controllers available soon for the TRS-80* MOD I, STD BUS, and other systems. Consult SIRIUS SYSTEMS for current prices and availabilities.

PACKAGES (NEW!!!)

20 MegaByte, S-100 or MOD II system with Hard Disk Drive, Case & Power Supply, Cables, OMEGA Controller and Documentation.....\$3615.

33 MegaByte, S-100 or MOD II System (as above).....\$4115.

154 MegaByte, S-100 or MOD II System (as above).....\$5820.

CP/M™ 2.2 Operating System for above packages (specify S-100 or MOD II).....\$170.

SPECIAL PURCHASE!! NEW SIEMENS 8" and 5 1/4" Disk Drives at SUPER DISCOUNTS!

SIEMENS FDD-100-8 Single sided, 8" Single or Double Density Disk Drive.....\$389.95

(2/\$359.95 ea)

SIEMENS FDD-100-5 Single sided, 5 1/4" Single or Double Density Disk Drive.....\$249.95

(2/\$229.95 ea)

SIEMENS Technical Manual (specify 8" or 5 1/4").....\$12.95

TFORTH!—what it has to offer YOU!

TFORTH is a procedural FORTH type language which specifies a process rather than a desired result. Designed to run on the TRS-80*, TFORH is a very powerful tool by itself or used in conjunction with Assembly Programming. A rich set of WORDS come with TFORH and many features considered as "extra" with other FORTH languages are standard with TFORH. These features include:

- Advanced Math Package
- Line Editor
- Macro Assembler
- Re-Entrant Code
- Super Graphics Capabilities
- Sophisticated User Functions
- 140 Page User's Manual
- Virtual memory
- Interpreter
- Compiler
- Produces CMD Files
- Expandable
- And many, many other features

TFORTH from SIRIUS comes on diskette complete for the TRS-80* with as little as 16K of memory and a single Disk Drive.

TFORTH.....\$129.95

STATE-OF-THE-ART DISK DRIVES

QUME® DataTrak 8 8" Disk Drive DOUBLE SIDED! DOUBLE DENSITY!

High performance Double Sided Disk 8" Disk Drive ■ Single or Double Density ■ Door Lock and Write Protect INCLUDED! ■ Negative DC Voltage not required ■ Low Power Operation

- FAST! 3ms track-to-track access
- Low friction and minimum wear
- Superior Head Load Dynamics

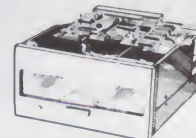
QUME DataTrak 8.....\$574.95

QUME Technical Manual.....\$12.95

Connector Set #3 (AC, DC, & Card Edge).....\$10.95

Connector Set #4 (AC and DC).....\$2.95

MPI 51/52 & 91/92 5 1/4" Disk Drives



- Fast! 5ms track-to-track access
- Exclusive Pulley-Band Design
- Unique Door/Ejector Mechanism
- Reliable 11/2% Speed Stability
- Single/Double Density Operation
- Industry/ANSI Standard Interface

MPI 51 (Single Head/40 tracks)

125K/250K Bytes Single/Double Density**.....\$259.95

MPI52 (Dual Head/80 tracks (40/side))

250K/500K Bytes Single/Double Density**.....\$349.95

MPI 91 (Single Head/80 tracks)

250K/500K Bytes Single/Double Density**.....\$399.95

MPI 92 (Dual Head/160 tracks (80/side))

500K/1000K Bytes Single/Double Density**.....\$524.95

MPI Technical Manual.....\$12.95

** Unformatted data storage

✓ 67

SIRIUS SYSTEMS

7528 Oak Ridge Highway
Knoxville, Tennessee 37921

TO ORDER CALL (615) 693-6583

Phone Orders Accepted 9AM-7PM (EST) Mon-Fri

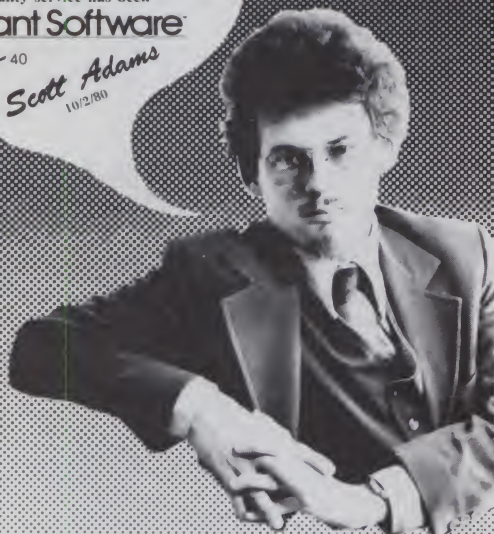
We accept MC, VISA, AE, COD (requires Certified Check, Cashier's Check or Cash) and Checks (personal checks require 14 days to clear). **SHIPPING AND HANDLING:** \$7.00 per Floppy Disk Drive or 80 + Module ■ 5% for other items (any excess will be refunded) ■ **Foreign Orders** add 10% for Shipping & Handling. Payment in U.S. currency ■ Tennessee residents add 6% Sales Tax ■ **VOLUME DISCOUNTS AVAILABLE**

In all my dealings with software
houses the one company
which has always impressed me with its high
quality service has been

Instant Software

✓ 40

Scott Adams
10/2/80



SCOTT ADAMS,
President of
Adventure International
and author of the
"Adventure" Series.

Instant Software

PETERBOROUGH, NEW HAMPSHIRE 03458 603-9247296

NEW PRICES... NEW SOFTWARE for **OHIO SCIENTIFIC**

(Prices effective Dec. 1, 1980)

WP6502 Word Processor Version 1.2

Cassette (all systems)	\$ 50
5 Inch diskette (all systems)	\$100
8 Inch disk for OS65D Systems	\$100
8 Inch disk for OS65U Systems	\$100
Programmed Instruction Training Course	\$ 25

Version 1.2 Enhancements

DQ Mail (DMS Interface)	\$ 75
DQ Duplicator (5" single drive copier)	\$ 30
DQ Duplicator for 8"	\$ 30
DQ Justify (TTY & Diablo Logic)	
Diablo/Qume & all NEC Spinwriters	
65D	\$ 50
65U	\$ 50
DQ Justify (TTY & Proportional Spacing)	
Parallel NEC Spinwriters & Centronics 737	
65D	\$ 50
65U	\$ 50
DQ Secretary. Dwo's enhanced 65D	\$ 50
DQ Secretary. Dwo's enhanced 65U for single user,	
timesharing and networking systems	\$250

WP6502 Word Processor Version 1.3 (January 1, 1980)

65D	\$250
65U	\$250
Multi-User & Networking	\$500
Programmed Instruction Training Course	\$ 25

Descriptive Brochure for all products.....FREE



Dwo Quong Fok Lok Sow

23 East 20th Street
New York City, N.Y. 10003 ✓ 87
(212) 673-6310

CLASSIFIEDS

Classified advertisements are intended for use by persons desiring to buy, sell or trade used computer equipment. No commercial ads are accepted.

Two sizes of ads are available. The \$5 box allows up to 5 lines of about 35 characters per line, including spaces and punctuation. The \$10 box allows up to 10 lines. Minimize use of capital letters to save space. No special layouts allowed. Payment is required in advance with ad copy. We cannot bill or accept credit.

Advertising text and payment must reach us 60 days in advance of publication (i.e., copy for March issue, mailed in February, must be here by Jan. 1). The publisher reserves the right to refuse questionable or inapplicable advertisements. Mail copy with payment to: **Classifieds, Kilobaud Microcomputing, Peterborough NH 03458**. Do not include any other material with your ad as it may be delayed.

Wanted: used cassette software for Apple II & books on computing. Send list for my offer. Ray Gabriel, PO Box 175, Madison, OH 44057.

For Sale: BASF C-10 computer cassettes. Low noise, high output, shipped prepaid UPS .75 each. A. Ringel W6KVO, 1118 Raintree Circle, Culver City, CA 90230.

For Sale: Mits Altair 88-DCDD floppy-disk drive and controller. Recently aligned and all ECOs installed. With all manuals and software including Altair Disk BASIC, \$700. Diablo printer with stand, print wheels, ribbons, paper and full documentation, \$1250. Will deliver within 75 miles. Call to arrange demo. Alan Frisbie, 3786 E. Mountain View, Pasadena, CA 91107, 213-351-2351 days, 796-7872 evenings.

For Sale: 12-inch B/W monitor. Composite video input, excellent resolution. Never used, in original carton. \$125. Mark Simpson, 900 Lake St., Apt. 8, Houghton, MI 49931. 906-482-8856.

Commodore PET. 16K RAM expandable to 32K on-board. 14K ROM w/machine-language monitor & improved BASIC. 8K ROM expansion sockets on-board. Typewriter keyboard and number pad. C2N external cassette recorder. Technical manuals plus "PET & IEEE Bus" and "PET Personal Computer Guide" books. \$750, plus shipping. Greg after 5 PM at 513-851-1936.

North Star 2 system. Double density, 48K, with D.C. Hayes modem. 2 serial & 1 parallel ports, Sorac IQ 140 terminal, Centronics 779 tractor printer, includes apx \$2000 in business software, 6 months old, in org boxes, \$4895 or best offer. Also one D.C. Hayes modem 100, \$325. Call Don, 615-526-7651.

Software (personal) for sale. Sold system must sell at super reduced prices. Dozens of CP/M, languages, business s/w (G/L, A/R, A/P, etc.). Send SASE for complete list and prices. Dee K. Moser, Box 638, Great Bend, KS 67530.

For Sale: Heath H9 video term., \$200; Cherry Pro Keybd w/encl., internal pwr sup., \$130. H9 prints lwr case input from Cherry/computer. H9 avail w/o mod. 1 ship. George Sullivan c/o Dr. P. Petcher, Chatom, AL 36518. 205-847-2262.

Diablo Hytype I Mod 1200 daisy wheel printer; new pin feed fric. platen & print wheel; white 'RO' cover; new Boschert switch supply; interface cable, service manual—\$1000. Barry: 415-228-6211.

For Sale or trade for Heath H-89 or H8 sys. Kenwood ham equ. TS520S + Ireq readout + AT200 tuner + 6 and 2m xverters and VFO. All service manuals and cables. Edward H. Hill, Sr., 317-545-8886.

F&D 64 x 16 VDB-1 video board for SWTP 6800 bus, assembled, socketed, not tested with complete documentation—\$75. Heath H-8, 8K static memory board assembled/tested without memory—\$50. Also Mostek VAB-2 (F8) video board 64 x 16 generates 128 ASCII chr's, parallel keyboard input, TTL/RS-232 serial out/in, composite video requires +5V @ .75A, with complete documentation—\$150. Paul Ramos, 100 Middle St., Woburn, MA 01801. 617-935-3758 after 6 PM.

Heath H-8: H9; excellent condition: (3) 8K memory boards, H-8-5 I/O board. All manuals. Estate sale price very cheap. All Benton Harbor software plus BASIC Programming Course. Leon Fernald, Box 1027, Kingshill, St. Croix, V.I. 00850. 809-778-3845.

For Sale: Netronics Elf II in steel enclosure, 24K static RAM boards, giant board, color graphics/music board, expansion P.S., rf modulator, fully socketed, all Netronics data, extras. All for \$425. Harold E. Kautz, Jr., 1115 E. Caracas Ave., Hershey, PA 17033. 717-534-2642, after 6 PM.

For Sale: Z-80 computer; 4K RAM, monitor, kybd, readout, cassette intf., EPROM programmer, 16 I/O ports, S-100, \$325. State logic analyser: 16-bit input, 5 MHz, 16 I.E.D, 4 hex readout, edge clocking, forward and backward stepping, \$390. 6809 computer: monitor, editor/assembler, RS-232, 16 I/O ports, timer, cassette intf, \$400. Gopaul, 3 Weymouth Ave., Toronto, Ont., M4C-1R6, Canada. 416-698-4405.

Super electronics shop for \$800! Instruments, tests (all Kilobaud notch), components, etc., everything. Owner can't use the approx. \$1800 tax credit. A roomful of prime at choice price! SASE for inv. \$1 for pix. 334 Riverside Drive, Palm Beach Gardens, FL 33410.

Find it Here!

MICRO QUIZ

(from page 20)

Answer: 9

At statement 70:

X(1) = 4 X(4) = 5

X(2) = 9 X(5) = 1

X(3) = 2 X(6) = 8

Statement 90 changes the value of V only when it reaches an element of X greater than V's current contents. Thus, V contains the largest element of X.

Add-On Disk Drive Subsystems For Apple, TRS-80, S-100 Based Computers



Expansion and enhanced capabilities are key words in achieving full utilization of your computer system. Our complete line of LOBO disk drive subsystems are the ideal, cost-effective way to provide the expansion capabilities you need to meet your system growth requirements. All of our subsystems are complete, thoroughly-tested, 100% burned-in, and feature a 1 year 100% parts/labor warranty.

APPLE

3101	Minifloppy, 3101I Minifloppy w/interface card
8101CA	One SA800 in cabinet w/power, DDC* Controller, cable and manual
8202CA	Two SA800 in cabinet w/power, DDC* Controller, cable and manual
5101CA	One SA850 in cabinet w/power, DDC* Controller, cable and manual
5202CA	Two SA850 in cabinet w/power, DDC* Controller, cable and manual

*Double Density Controller

S-100 BASED COMPUTERS

MODEL NO.	DESCRIPTION
4101C	SA400 in cabinet w/power
8212C	Two SA801 in cabinet w/power
5212C	Two SA851 in cabinet w/power

GENERAL

MODEL NO.	DESCRIPTION
8212	Two SA801 in cabinet
8212C	Two SA801 in cabinet w/power
5212	Two SA851 in cabinet
5212C	Two SA851 in cabinet w/power

TRS80

MODEL NO.	DESCRIPTION	MODEL NO.	DESCRIPTION
4101C	SA400 in cabinet w/power	C808	Cable for TRS80 Eight-inch Floppy
8101C II	One SA800 in cabinet w/power for Mod. II	LX80	Double-density expansion interface
8202C II	Two SA800 in cabinet w/power for Mod. II	RS232	Dual Serial Port Option
C802	Cable for Mod. II	16K	16K Byte RAM for LX80 (32KB max.)
C805	Cable for TRS80 Minifloppy	VTOS	4.0 Disk Operating System

JR 126

INVENTORY CO.,

P.O. Box 185, Santa Ynez, Ca., 93460
(805) 688-8781

ADD DISK DRIVES TO YOUR MODEL III AND SUPERBRAIN



**SAVE UP TO 34%
COMPARED TO RADIO SHACK**
Now, add mini-disk drives to your
TRS-80 Model III and get
FREE INSTALLATION.

Fully compatible with Radio Shack's operating system
TRSDOS.

- One, two, three, four drive configurations.
- 134K to over 1 Meg of storage
- 40 track and 80 track available
- Gray cases to match your system
- 90 day warranty, 100% parts and labor
- Extended warranty available

Complete upgrade includes one mini-disk drive, power supply, controller, and mounting hardware. **IMMEDIATE DELIVERY.**

	OUR PRICE	RADIO SHACK	SAVINGS
Complete one drive kit	\$599.	\$849.	29%
Additional internal drive	265.	399.	34%
External drive	340.	499.	32%
80 track drives (inc. patch) add 150. ea.	N/A		
Additional one year warranty	45. ea.	N/A	
16K memory (required to use drives)	49.	119.	59%

To order call toll free (1) 800 345-8102
(outside PA), or (215) 461-5300 in PA.

VR Data corporation 777 Henderson Boulevard Folcroft, Pa. 19032



AVAILABLE ONLY FROM VR DATA!

Increase the storage capacity of your
SuperBrain to 700K with two extra
40 track drives, or over 1 Meg with
QD drives.

- Fully compatible with SuperBrain operating system
- Fully compatible with all SuperBrain drives
- Easy plug-in installation
- Includes patch program
- 90 day warranty, 100% parts and labor
- Extended warranty available

If you need more storage now, don't wait for costly
hard disk units and buy more storage than you need.

SAVE AND GET 1 Meg of STORAGE

Complete two drive kit (incl. cable and patch)	789.
QD drive	add 150.
Additional one year warranty	45.

VR Data, a manufacturer of innovative computer
products, is known worldwide for quality, dependability
and prompt, personal service since 1972.

VR Data



DEALER DIRECTORY

Phoenix, AZ

Software Specialists! Authorized dealers in quality software packages. Experts provide comprehensive product demonstrations, outstanding support and free consultation. Resident CP/M swami. Arizona's finest service department. **The Denver-Ridge Group, Suite 104, 8900 North Central Avenue, Phoenix, AZ 85020, 944-8371.**

El Monte, CA

Ohio Scientific specialist in the San Gabriel Valley serving greater Los Angeles. Full product line on display. Specializing in business computers. In-house service. Custom programming. Terminals. Printers. Open Mon-Sat, 9 AM-7 PM. **Computer & Video, 3380 Flair Dr., Suite 207, El Monte, CA 91731, 572-7292.**

San Jose, CA

Bay area's newest computer software store. Featuring Instant Software for the TRS-80, magazines, books. **Shaver Radio, 1378 S. Bascom Ave., San Jose, CA 95128, 998-1103.**

San Jose, CA

New and used computer products—specializing in S-100 boards, printers, drives, chassis and complete systems, as well as supplies and parts—Imjai, Tandon, Diablo—5000 sq. ft. **W/W Component Supply, Inc., 1771 Junction Ave., San Jose, CA 95112.**

Denver, CO

Tantalizing software for your microcomputer. We have software applications for both home and business. Ask for prices on diskettes, tapes, custom forms, checks, etc. **The Software Gourmet, 1111 South Pearl St., Denver, CO 80210, 777-8890.**

Sarasota, FL

Dynabyte computer systems, Hazeltine and NEC, Word-Star, Structured Systems accounting. Consulting, training, sales, service. **Glisco, Inc., 4001 Roberts Point Rd., Sarasota, FL 33581, 349-0200.**

Sarasota, FL

Real-Time/Industrial Software Engineering Consultants. Top-down design and structured techniques utilized. **Advanced Computer Concepts, Inc., PO Box 15710, Sarasota, FL 33579.**

Tampa, FL

Apple Computer sales and service. S-100 boards from SSM, Godbout, Thinker Toys, California Computer Systems. Computer books and magazines. **AMF Microcomputer Center, Inc., 11158 N. 30th Street, Tampa, FL 33612, 971-4072, 977-0708.**

Aurora, IL

Microcomputer systems for home or business; peripherals, software, books & magazines. Apple, Hewlett-Packard, North Star, Cromemco systems. IDS-440G printer w/Apple graphics, new HP-85 & HP calculators. **Farnsworth Computer Center, 1891 N. Farnsworth Ave., Aurora, IL 60505, 851-3888.**

Chicago, IL

Computer Hardware/Specialists for home and business. Largest selection of computer books, magazines and copyrighted software in Illinois. Experienced factory-trained service department. Feature Apple, Alpha Microsystems and Hewlett-Packard calculators and accessories. **Data Domain of Schaumburg, 1612 E. Algonquin Rd., Schaumburg, IL 60195, 397-8700.**

Chicago, IL

Brand new lowest prices, never undersold, postpaid in USA—Teletype 43 keyboard printers, Okidata & Integral Data printers, SS-50 bus computers, peripherals & business software. **Data Mart, 914 East Waverly Street, Arlington Heights, IL 60004, 398-8525.**

Dial a Dealer

Herington, KS

Hardware support. Maintenance and service for all microcomputers and peripherals. Kits assembled or debugged. Radio Shack (mods OK) repaired. Quality work, fast turnaround and reasonable cost. **Prairie Micro Clinic, Box 325, Herington, KS 67449, 258-2179.**

Garden City, MI

Books, magazines, hardware and software for Apple, North Star, TRS-80 and PET. **Computer Center, 28251 Ford Rd., Garden City, MI 48135, 425-2470.**

Hannibal, MO

Ohio Scientific products, modifications, service, software. 8" disk for C1p, C4p. Process control specialist. **E&I Technical Service, 5300 Paris Gravel Road, Hannibal, MO 63401, 248-0084.**

Portland, OR

Ohio Scientific specialists for business and personal computers. Local service. Terminals, printers, custom programming. Full OSI product line on display! 10 AM to 6 PM M-F. **Fial Computer, 11266 SE 21st Ave., Milwaukie, OR 97222, 654-9574.**

Dealers: Listings are \$15 per month in prepaid quarterly payments, or one yearly payment of \$150, also prepaid. Ads include 25 words describing your products and services plus your company name, address and phone. (No area codes or merchandise prices, please.) Call Marcia at 603-924-7138 or write **Kilobaud Microcomputing, Ad Department, Peterborough, NH 03458.**

Who Says Programmers Are Dull?

Here's a chance to display your creative, imaginative and artistic talents!

Enter the first **Microcomputing Graphics Contest**. You can win \$100 for the best microcomputer-generated graphics display in any of the following categories:

- Color video
- Black and white video

- Printer hard copy
- Plotter hard copy

Second prize is a \$50 certificate for books from our Book Nook section. Third prize is a one-year subscription to Microcomputing.

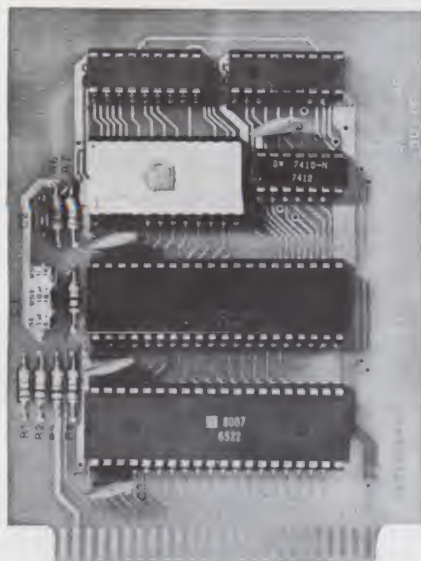
Limit: two submissions per category.
Deadline: April 1, 1981.

Winners will be selected by a panel of judges from the computer science and art departments of Keene State College (Keene, N.H.) and Franklin Pierce College (Rindge, N.H.).

- The following information must accompany each entry: Your name, address and phone number; the category of the entry; title of the entry; description of the hardware; name of any commercial software used in the creation of your work.

- For video categories, send 5x7 inch glossy prints of the artwork as it appears on your video display.
- For the hard-copy categories, send full-size originals.
- While you don't need to submit programs with your entries, they must be available on request.
- No minis or mainframes allowed.
- Entries become the property of *Microcomputing* magazine, and cannot be returned.
- Address entries to **Graphics Contest, Kilobaud Microcomputing Editorial Dept., Peterborough, NH 03458.**

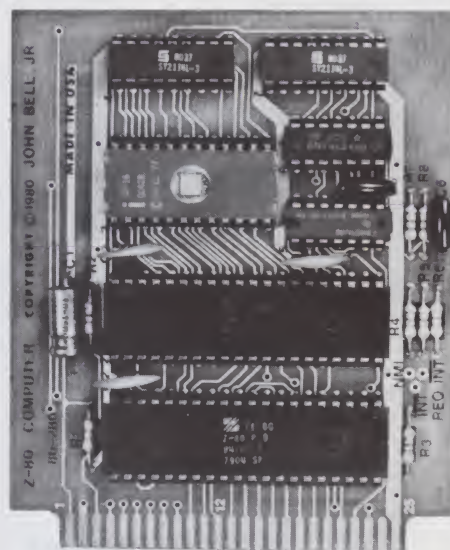
6502, Z80, 8080 AND 8085 USERS



JOHN BELL ENGINEERING'S 6502 AND Z80 MICROCOMPUTERS ARE DEDICATED COM- PUTERS DESIGNED FOR CONTROL FUNCTIONS.

THESE BOARDS FEATURE:

- 2048 BYTES EPROM
- 1024 BYTES RAM
- ALL BOARDS INCLUDE COMPLETE DOCUMENTATION
- 50 PIN CONNECTOR INCLUDED IN KITS AND ASSEMBLED UNITS
- 2716 AVAILABLE SEPARATELY



JOHN BELL ENGINEERING'S 6502 MICROCOMPUTER, 2716 EPROM PROGRAM- MER AND APPLE II PARALLEL INTERFACE PLUS THE APPLE II MICROCOMPUTER — A COMPLETE DEVELOPMENT SYSTEM.

6502 MICROCOMPUTER FEATURES:

- 1024 BYTES RAM
- 2048 BYTES EPROM
- USES ONE 6522 VIA (DOC. INCL.)
- 2 8 BIT BIDIRECTIONAL I/O PORTS
- 2 16 BIT PROGRAMMABLE TIMER/COUNTERS
- SERIAL DATA PORT
- LATCHED I/O WITH HANDSHAKING LOGIC
- TTL AND CMOS COMPATIBLE

80-153 **ASSEMBLED \$110.95**
BARE BOARD \$24.95 KIT \$ 89.95

JOHN BELL ENGINEERING'S NEW Z80 MICROCOMPUTER FEATURES:

- Z80 CPU SOFTWARE COMPATIBLE WITH Z80, 8080 AND 8085 MICROPROCESSORS
- 2048 BYTES EPROM
- 1024 BYTES RAM
- SINGLE 5V POWER SUPPLY AT 300MA
- CLOCK FREQUENCY IS 2MHZ, RC CONTROLLED
- Z80 PIO (DOC. INCL.)
- 2 8 BIT BIDIRECTIONAL I/O PORTS
- LATCHED I/O WITH HANDSHAKING LOGIC
- TTL AND CMOS COMPATIBLE

80-280 **ASSEMBLED \$129.95**
BARE BOARD \$29.95 KIT \$119.95

USE YOUR 6502 OR Z80 MICROCOMPUTER TO CONTROL EVERYTHING!

- YOUR HOME SECURITY SYSTEM
- HEAT CONTROL
- LIGHT CONTROL
- SOLAR HEATING AND POWER SYSTEMS
- AUTOMATIC CONTROL OF TAPE RECORDERS
- TRAFFIC LIGHT CONTROL
- IRRIGATION SYSTEMS
- AUTOMATIC CONTROL OF VIDEO RECORDERS
- ROBOT CONTROL
- AUTOMATIC DIALER
- AUTOMATED SLIDE SHOW CONTROL
- COMMUNICATION SYSTEMS FOR THE DISABLED
- THE WORLD



JOHN BELL ENGINEERING

VISA

ALL PRODUCTS ARE AVAILABLE FROM: JOHN BELL ENGINEERING
P.O. BOX 338 • REDWOOD CITY, CA 94064 • (415) 367-1137

*SEND FOR OUR COMPLETE CATALOG! ADD 6% SALES TAX IN CALIFORNIA. ADD 5% FOR SHIPPING AND HANDLING.

MASTER
CHARGE



Skyles Electric Works ✓66

BASIC Programmer's, Toolkit™, Disk-O-Pro™, Command-O™

For PET™ Owners Who Want More Fun And Fewer Errors with Their Programs

Here are thirty-five commands you'll need, all on dual chips you can install in two minutes without tools, **on any PET or PET system**. 2KB or 4KB of ROM firmware on each chip with a collection of machine language programs available from the time you turn on your PET to the time you shut it off. No tape to load or to interfere with any running programs.

For PET/CBM 2001-8, -8N, -16N/B, -32N/B, 3016 and 3032

BASIC Programmers Toolkit™ commands

**AUTO^{ed} DELETE^{ed} RENUMBER^{ed} HELP^{ed} TRACE^{ed}
STEP^{ed} OFF^{ed} APPEND^{ed} DUMP^{ed} FIND^{ed}**

BASIC Programmers Disk-O-Pro™

**CONCAT^{B80} DOPEN^{B80} DCLOSE^{B80} RECORD^{B80} HEADER^{B80} COLLECT^{B80}
BACKUP^{B80} COPY^{B80} APPEND^{B80} DSAVE^{B80} DLOAD^{B80} CATALOG^{B80}
rename^{B80} SCRATCH^{B80} DIRECTORY^{B80} INITIALIZE^{BS} MERGE^{BS} EXECUTE^{BS}
SCROLL^{ed} OUT^{ed} SET^{ed} KILL^{ed} EAT^{ed} PRINT USING^{BS} SEND^{BS} BEEP^{BS}**

```
RUN
?DIVISION BY ZERO ERROR IN 500
READY.
HELP
500 J = SQR(A*B/(G))
READY
```

```
APPEND "INPUT"
PRESS PLAY ON TAPE #1
OK
SEARCHING FOR INPUT
FOUND INPUT
APPENDING
READY.
```

```
RUN
READY.
DUMP
A1 = 10
BW = -6.1
CS = "HI"
READY.
```

NOTES:

ed — a program editing and debugging command

B80 — a BASIC command also available on Commodore CBM™ 8016 and 8032 computers.

BS — a Skyles Electric Works added value BASIC command.

BASIC Programmers Toolkit™ is a trademark of Palo Alto IC's.

BASIC Programmers Disk-O-Pro™, Command-O™ are trademarks of Skyles Electric Works.

PET™, CBM™ are trademarks of Commodore Business Machines.

AVAILABLE:

USA/CANADA: Please contact your local dealer

Phone or write for information. We'll be delighted to answer any questions
and to send you the complete information package.



Skyles Electric Works

231 E South Whisman Road
Mountain View, CA 94041
(415) 965-1735



Skyles Electric Works ✓66

BASIC Programmer's, Toolkit™, Disk-O-Pro™, Command-O™

For CBM™ Owners Who Want More Fun And Fewer Errors with Their Programs

Here are nineteen commands you'll need, on a single chip you can install in two minutes without tools, on any CBM or CMB system. 4KB of ROM firmware on each chip with a collection of machine language programs available from the time you turn on your PET to the time you shut it off.

For CBM 8016 and 8032; BASIC 4.0

BASIC Programmers Command-O™

**AUTO^{ed} DUMP^{ed} DELETE^{ed} FIND^{ed} (improved) HELP^{ed} KILL^{ed} OFF^{ed}
TRACE^{ed} (improved) RENUMBER^{ed} (improved) INITIALIZE^{BS} MERGE^{BS} MOVE^{BS}
EXECUTE^{BS} SCROLL^{ed} OUT^{ed} SET^{ed} SEND^{BS} PRINT USING^{BS} BEEP^{BS}**

```
100 GOSUB 180
105 PRINT USING CS, A, BS
130 INPUT "TIME", DS
131 INPUT "DAY", ES
160 IFB< -C THEN 105
180 FOR X=IT09
183 PRINT Y(X):NEXT
184 RETURN
200 I=X/19
READY
RENUMBER 110, 10, 105-184
READY
LIST
100 GOSUB 150
110 PRINT USING CS, A, BS
120 INPUT "TIME", DS
130 INPUT "DAY", ES
140 IFB< -C THEN 110
150 FOR X=IT09
160 PRINT Y(X):NEXT
170 RETURN
200 I=X/19
READY
```

```
MERGE D1 "BUY NOW*"
SEARCHING FOR BUY NOW*
LOADING
READY
RENUMBER 100, 10
READY
FIND BS
110 PRINT USING AS, BS, BS+CS+DS
290 BS="NOW IS THE TIME"
READY
```

```
580 BA=BA-1
590 RA=123*5X/92+BA*10
600 IF BA=143 THEN 580
610 RETURN
620 CS="PROFIT $,###.## DAILY"
630 PRINT USING CS, PI
640 DS="LOSS $,###.## DAILY"
650 PRINT USING DS, LI
RUN
PROFIT $1,238.61 DAILY
LOSS $ 0.00 DAILY
READY
```

```
180 FOR A=4096T08191:DOKEA, B:B-B-1:PRIN
T B:IFB<255 THEN B=B-255:PRINT B
TRACE
```

PRICES:

BASIC Programmers Toolkit™ (chip only)	\$40.00
BASIC Programmers Disk-O-Pro™ (chip only)	\$75.00
BASIC Programmers Command-O™ (chip only)	\$75.00
Interface boards (needed sometimes)	\$20.00-\$50.00
Instruction Manual (with redeemable \$5.00 coupon)	\$5.00

Shipping and handling \$2.50 USA/Canada, \$10.00 Europe/Asia

California residents please add 6% or 6-1/2% sales tax as required

Reserve your Disk-O-Pro, Command-O today

Toolkit™ immediate delivery, Disk-O-Pro delivery in December, Command-O delivery in January

VISA, MASTERCHARGE ORDERS CALL (800) 538-3083 (except California residents)

CALIFORNIA ORDERS PLEASE CALL (408) 257-9140



Skyles Electric Works

**231 E South Whisman Road
Mountain View, CA 94041
(415) 965-1735**

ORDER ENTRY/ACCOUNTS RECEIVABLE SYSTEMS



Fyrnetics President, Larry Larsen, and Controller, Dennis Turek, considering some of the features of their new security system.

generated such a high volume of sales orders and invoices that it became necessary to install a computer system in 1977 in order to handle the multi-million dollar annual sales volume.

"Fyrnetics initially installed a Wang 2200 computer system, equipped with seven CRT terminals, four 10 megabyte hard disk drives, and two line printers at a monthly lease cost of over \$4000.00. By late 1979, the company had invested nearly six man-years in our own software development", comments Fyrnetics president, Larry Larsen "As a part of a cost cutting program, we decided to replace the Wang equipment with a microcomputer system. We reviewed all available micro systems and concluded that the MSI hardware and software packages were best suited to our needs."



"We were particularly pleased with the system-generation capability of the MSI business packages, which allowed us to utilize our existing continuous form sales orders, invoices, and packing lists. The requirements for our computer system were rather demanding since we had large customers such as Montgomery Wards and Wicks, each having up to 300 stores. Each store is treated as an individual customer during the order entry and shipping process. However, payment is made from a central accounting office with many stores on a single check. Our system had to allow us to properly credit the payment to many different store locations and invoices. This feature was a part of the MSI Accounts Receivable software package. **Our accounts receivable system handles over 750 regular customers with over 3000 open invoices and 10,000 transactions per month for us.**"

The LIFESAVER line of wireless home security products manufactured by Fyrnetics, Inc. Anyone desiring more information on this interesting product line should contact Fyrnetics, Inc. at the above address.

THE COMPANY:
FYRNETICS, INC.
1021 DAVIS ROAD
ELGIN, ILLINOIS 60120
312-742-0282

Fyrnetics, Inc. of Elgin, Illinois has grown from a private manufacturer of ionization smoke detectors for companies, such as Sears & Roebuck, to a full line manufacturer of wireless security products which are sold through a worldwide network of dealers and distributors. Since saturation of the residential security market is estimated to be less than 3% in the United States, their major marketing effort has been directed toward distribution through dealers who demonstrate and sell electronic products to the consumer. This marketing approach



The modern production facility at Fyrnetics, Inc. where wireless home security products are designed and manufactured. The company also has production facilities in Hong Kong where larger quantities of their products are manufactured.

CONSIDERATIONS FOR THE SELECTION OF ACCOUNTS RECEIVABLE SYSTEMS

The selection of business computer systems today involves the careful consideration of many different factors. Even though the cost of computer systems has dropped substantially, we considered the selection process to be highly critical to us because of the tremendous need for a highly reliable computer system in our daily operations. Due to our high volume of sales transactions we were highly dependent upon the system for order processing and for information. We considered the following issues to be key to our selection of the MSI system:

LARGE DATA BASE - The processing of over 700 orders per month, with 3000 open invoices and 5000 active statement items required that we have easy and efficient on-line access to our large data base. The MSI system provides a large selection of data reports for open orders, backorders, invoices, credit memos, as well as customer statements and account status information.

EFFICIENT PAPERWORK FLOW - The processing of our large volume of sales orders required an efficient system for printing sales orders, packing lists, invoices, and customer statements. The MSI system offers a convenient system generation program which allows the use of any desired format for pre-printed continuous forms. In addition, packing lists and customer invoices are generated automatically as sales orders are processed.

GENERAL LEDGER TIE-IN - Due to the large volume of individual invoices and cash receipts, we required an automatic posting procedure for our general ledger programs in order to minimize the data entry process. The MSI system offers a complete general ledger program package which links automatically to the other business program modules. All invoices, as well as cash receipts, are automatically written to the general ledger posting files from which individual journals are created. This procedure insures the generation of balanced journals and greatly reduces the time requirement for generation of monthly income statement and balance sheets.

SYSTEM INTEGRATION - The MSI system is fully integrated. The order entry system is linked to inventory for correct pricing, description of items on order. The inventory system is also linked to general ledger to allow different categories of products sold to be automatically posted to the correct sales accounts. The MSI inventory system provides complete cost accounting information for both labor and material. **The MSI programs provide the big machine capability that we need and yet provide the flexibility that we desire.**



The MSI computer system drives two line printers at Fyrnetics, Inc.



The MSI computer system at Fyrnetics, Inc. employs 10 megabyte hard disk drives to contain the large on-line data base.

SUPPORT - The availability of source listings for all of the MSI business software was an added incentive to select the MSI system. This has allowed us to make some specialized enhancements to our programs easily. **MSI really delivered for us allowing the replacement of an expensive WANG 2200 system with a comparable MSI system at a fraction of the cost.**

If you would like to have more information on MSI business computer systems, call or write, **Midwest Scientific Instruments, Inc., 220 W. Cedar, Olathe, KS 66061, 800-255-6638, Telex 42525(MSI A OLAT).**

MSI Helping to make your business run better.

kb microcomputing book nook

3 NEW BOOKS

● **SOME OF THE BEST FROM KILOBAUD/MICROCOMPUTING**—BK7311—A collection of the best articles that have recently appeared in Kilobaud/MICROCOMPUTING. Included is material on the TRS-80 and PET systems, CP/M, the 8080/8085/Z80 chips, the ASR-33 terminal. Data base management, word processing, text editors and file structures are covered too. Programming techniques and hardware construction projects for modems, high speed cassette interfaces and TVTs are also included in this large format, 200 plus page edition. \$10.95.*

● **UNDERSTANDING AND PROGRAMMING MICROCOMPUTERS**—BK7382—A valuable addition to your computing library. This two part text includes the best articles that have appeared in 73 and Kilobaud Microcomputing magazines on the hardware and software aspects of the new microcomputing hobby. Well known authors and well structured text helps the reader get involved in America's fastest growing hobby. \$10.95*

● **40 COMPUTER GAMES**—BK7381—Forty games in all in nine different categories. Games for large and small systems, and even a section on calculator games. Many versions of BASIC used and a wide variety of systems represented. A must for the serious computer gamesman. \$7.95*

— INTRODUCTORY —

● **HOBBY COMPUTERS ARE HERE!**—BK7322—If you (or a friend) want to come up to speed on how computers work... hardware and software... this is an excellent book. It starts with the fundamentals and explains the circuits, and the basics of programming. This book has the highest recommendations as a teaching aid for newcomers. \$4.95.*

● **THE NEW HOBBY COMPUTERS**—BK7340—This book takes it from where "HOBBY COMPUTERS ARE HERE!" leaves off, with chapters on Large Scale Integration, how to choose a microprocessor chip, an introduction to programming, low cost I/O for a computer, computer arithmetic, checking memory boards... and much, much more! Don't miss this tremendous value! Only \$4.95.*

— INTRODUCTION TO MICROCOMPUTERS (VOL. 0→III) —

● **AN INTRODUCTION TO MICROCOMPUTERS, VOL. 0**—BK1130—The Beginner's Book—Written for readers who know nothing about computers—for those who have an interest in how to use computers—and for everyone else who must live with computers and should know a little about them. The first in a series of 4 volumes, this book will explain how computers work and what they can do. Computers have become an integral part of life and society. During any given day you are affected by computers, so start learning more about them with Volume 0. \$7.95.*

● **VOL. I**—BK1030—2nd Edition completely revised. Dedicated to the basic concepts of microcomputers and hardware theory. The purpose of Volume I is to give you a thorough understanding of what microcomputers are. From basic concepts (which are covered in detail), Volume I builds the necessary components of a microcomputer system. This book highlights the difference between minicomputers and microcomputers. \$12.99.*

● **VOL. II**—BK1040 (with binder)—Contains descriptions of individual microprocessors and support devices used only with the parent microprocessor. Volume II describes all available chips. \$31.99*

● **VOL. III**—BK1133 (with binder)—Contains descriptions of all support devices that can be used with any microprocessor. \$21.99*

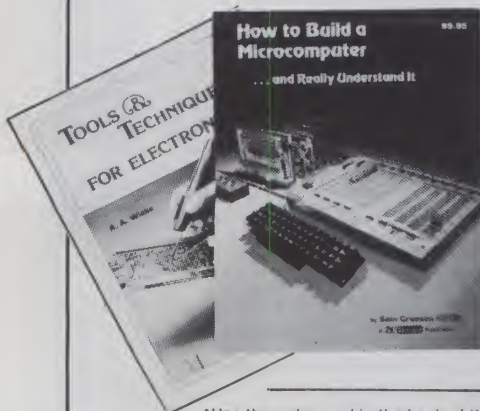
● **HOW TO BUILD A MICROCOMPUTER — AND REALLY UNDERSTAND IT** — BK7325 — by Sam Creason. The electronics hobbyist who wants to build his own microcomputer system now has a practical "How-To" guidebook. This book is a combination technical manual and programming guide that takes the hobbyist step-by-step through the design, construction, testing and debugging of a complete microcomputer system. Must reading for anyone desiring a true understanding of small computer systems. \$9.95.*

● **TOOLS & TECHNIQUES FOR ELECTRONICS** — BK7348 — by A. A. Wicks is an easy-to-understand book written for the beginning kit builder as well as the experienced hobbyist. It has numerous pictures and descriptions of the safe and correct ways to use basic and specialized tools for electronic projects as well as specialized metal working tools and the chemical aids which are used in repair shops. \$4.95.*

*Use the order card in the back of this magazine or itemize your order on a separate piece of paper and mail to Kilobaud Microcomputing Book Department • Peterborough NH 03458. Be sure to include check or detailed credit card information. No C.O.D. orders accepted. All orders add \$1.00 handling. Please allow 4-6 weeks for delivery. Questions regarding your order? Please write to Customer Service at the above address.

"PRICES SUBJECT TO CHANGE WITHOUT NOTICE"

FOR TOLL FREE ORDERING CALL 1-800-258-5473



kb microcomputing book nook

SPECIAL INTERESTS

new!

new!

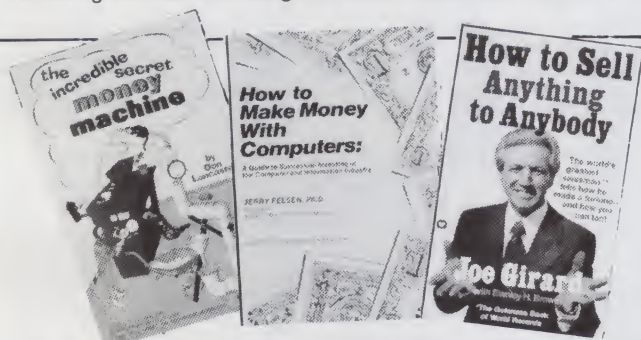
● **MICROSOFT BASIC DECODED AND OTHER MYSTERIES**—BK1186—by James Favour. From the company that brought you *TRS-80 DISK AND OTHER MYSTERIES*! Contains more than 6500 lines of comments for the disassembled Level II ROMs, six additional chapters describing every BASIC subroutine, with assembly language routines showing how to use them. Flow charts for all major routines give the reader a real insight into how the interpreter works. \$29.50 (Available after December 20th).

● **THE CP/M HANDBOOK (with MP/M)**—BK1187—by Rodney Zaks. A complete guide and reference handbook for CP/M—the industry standard in operating systems. Step-by-step instruction for everything from turning on the system and inserting the diskette to correct user discipline and remedial action for problem situations. This also includes a complete discussion of all versions of CP/M up to and including 2.2, MP/M and CDOS. \$13.95.

● **TRS-80 DISK AND OTHER MYSTERIES**—BK1181—by Harvard C. Pennington. This is the definitive work on the TRS-80 disk system. It is full of detailed "How to" information with examples, samples and in-depth explanations suitable for beginners and professionals alike. The recovery of one lost file is worth the price alone. \$22.50.*

● **INTRODUCTION TO TRS-80 GRAPHICS**—BK1180—by Don Inman. Dissatisfied with your Level I or Level II manual's coverage of graphics capabilities? This well-structured book (suitable for classroom use) is ideal for those who want to use all the graphics capabilities built into the TRS-80. A tutorial method is used with many demonstrations. It is based on the Level I, but all material is suitable for Level II use. \$8.95.*

● **MICROPROCESSOR INTERFACING TECHNIQUES**—BK1037—by Austin Lesea & Rodney Zaks—will teach you how to interconnect a complete system and interface it to all the usual peripherals. It covers hardware and software skills and techniques, including the use and design of model buses such as the IEEE 488 or S100. \$15.95.*



MONEYMAKING

● **HOW TO MAKE MONEY WITH COMPUTERS**—BK1003—In 10 information-packed chapters, Jerry Felsen describes more than 30 computer-related, money-making, high profit, low capital investment opportunities. \$15.00.*

● **HOW TO SELL ANYTHING TO ANYBODY**—BK7306—According to *The Guinness Book of World Records*, the author, Joe Girard, is "the world's greatest salesman." This book reveals how he made a fortune—and how you can, too. \$2.25.*

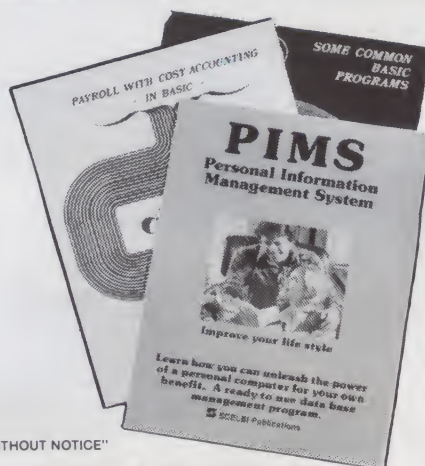
● **THE INCREDIBLE SECRET MONEY MACHINE**—BK1178—by Don Lancaster. A different kind of "cookbook" from Don Lancaster. Want to slash taxes? Get free vacations? Win at investments? Make money from something that you like to do? You'll find this book essential to give you the key insider details of what is really involved in starting up your own money machine. \$5.95.*

BUSINESS

● **PAYROLL WITH COST ACCOUNTING—IN BASIC**—BK1001—by L. Poole & M. Borchers, includes program listings with remarks, descriptions, discussions of the principle behind each program, file layouts, and a complete user's manual with step-by-step instructions, flowcharts, and simple reports and CRT displays. Payroll and cost accounting features include separate payrolls for up to 10 companies, time-tested interactive data entry, easy correction of data entry errors, job costing (labor of distribution), check printing with full deduction and pay detail, and 16 different printed reports, including W-2 and 941 (in CBASIC). \$20.00.*

● **SOME COMMON BASIC PROGRAMS**—BK1053—published by Adam Osborne & Associates, Inc. Perfect for non-technical computerists requiring ready-to-use programs. Business programs, plus miscellaneous programs. Invaluable for the user who is not an experienced programmer. All will operate in the stand-alone mode. \$14.99 paperback.

● **PIMS: PERSONAL INFORMATION MANAGEMENT SYSTEM**—BK1009—Learn how to unleash the power of a personal computer for your own benefit in this ready-to-use data-base management program. \$11.95.*



PRICES SUBJECT TO CHANGE WITHOUT NOTICE

*Use the order card in the back of this magazine or itemize your order on a separate piece of paper and mail to Kilobaud Microcomputing Book Department • Peterborough NH 03458. Be sure to include check or detailed credit card information. No C.O.D. orders accepted. All orders add \$1.00 handling. Please allow 4-6 weeks for delivery. Questions regarding your order? Please write to Customer Service at the above address.

FOR TOLL FREE ORDERING CALL 1-800-258-5473

kb microcomputing book nook

—PROGRAMMING & COOK BOOKS—



new!

—Z80—

● **INSIDE LEVEL II** — BK1183 — For machine language programmers! This is a comprehensive reference guide to the Level II ROMs, allowing easy utilization of the sophisticated routines they contain. It concisely explains set-ups, calling sequences, variable passage and I/O routines. Part II presents an entirely new composite program structure which unloads under the SYSTEM command and executes in both BASIC and machine code with the speed and efficiency of a compiler. Special consideration is given to disk systems. \$15.95.*

● **PROGRAMMING THE Z-80** — BK1122 — by Rodney Zaks. Here is assembly language programming for the Z-80 presented as a progressive, step-by-step course. This book is both an educational text and a self-contained reference book, useful to both the beginning and the experienced programmer who wish to learn about the Z-80. Exercises to test the reader are included. \$14.95.*

● **Z-80 ASSEMBLY LANGUAGE PROGRAMMING** — BK1177 — by Lance A. Leventhal. This book thoroughly covers the Z80 instruction set, abounding in simple programming examples which illustrate software development concepts and actual assembly language usage. Features include Z80 I/O devices and interfacing methods, assembler conventions, and comparisons with 8080A/8085 instruction sets and interrupt structure. \$16.99.*

● **Z-80 SOFTWARE GOURMET GUIDE AND COOKBOOK** — BK1045 — by Nat Wadsworth. Scelbi's newest cookbook! This book contains a complete description of the powerful Z-80 instruction set and a wide variety of programming information. Use the author's ingredients including routines, subroutines and short programs, choose a time-tested recipe and start cooking! \$15.95.*

—6502—

● **PROGRAMMING THE 6502 (Third Edition)** — BK1005 — Rodney Zaks has designed a self-contained text to learn programming, using the 6502. It can be used by a person who has never programmed before, and should be of value to anyone using the 6502. The many exercises will allow you to test yourself and practice the concepts presented. \$12.95.*

● **6502 APPLICATIONS BOOK** — BK1006 — Rodney Zaks presents practical-application techniques for the 6502 microprocessor, assuming an elementary knowledge of microprocessor programming. You will build and design your own domestic-use systems and peripherals. Self-test exercises included. \$12.95.*

● **6502 ASSEMBLY LANGUAGE PROGRAMMING** — BK1176 — by Lance A. Leventhal. This book provides comprehensive coverage of the 6502 microprocessor assembly language. Leventhal covers over 80 programming examples from simple memory load loops to complete design projects. Features include 6502 assembler conventions, input/output devices and interfacing methods, and programming the 6502 interrupt system. \$16.99.*

● **6502 SOFTWARE GOURMET GUIDE AND COOKBOOK** — BK1055 — by Robert Findley. This book introduces the BASIC language programmer into the realm of machine-language programming. The description of the 6502 structure and instruction set, various routines, subroutines and programs are the ingredients in this cookbook. "Recipes" are included to help you put together exactly the programs to suit your taste. \$12.95.*

● **MICROCOMPUTING CODING SHEETS** *Microcomputing's* dozen or so programmers wouldn't try to work without these handy scratch pads, which help prevent the little errors that can cost hours and hours of programming time. Available for programming in Assembly/Machine Language (PD1001), which has columns for address, instruction (3 bytes), source code (label, op code, operand) and comments; and for BASIC (PD1002) which is 72 columns wide. 50 sheets to a pad. \$2.39.*

—8080 / 8080A—

● **8080A/8085 Assembly Language Programming** — by Lance Leventhal — BK1004 — Assembly language programming for the 8080A/8085 is explained with a description of the functions of assemblers and assembly instructions, and a discussion of basic software development concepts. Many fully debugged, practical programs are included as is a special section on structured programming. \$15.99.*

● **8080 PROGRAMMING FOR LOGIC DESIGN** — BK1078 — Ideal reference for an indepth understanding of the 8080 processor. Application-oriented and the 8080 is discussed in light of replacing conventional, hard-wired logic. Practical design considerations are provided for the implementation of an 8080-base control system. \$9.50.*

● **8080 SOFTWARE GOURMET GUIDE AND COOKBOOK** — BK1102 — If you have been spending too much time developing simple routines for your 8080, try this new book by Scelbi Computing and Robert Findley. Describes sorting, searching, and many other routines for the 8080 user. \$12.95.*

—6800—

● **6800 PROGRAMMING FOR LOGIC DESIGN** — BK1077 — Oriented toward the industrial user, this book describes the process by which conventional logic can be replaced by a 6800 microprocessor. Provides practical information that allows an experimenter to design a complete micro control system from the "ground up." \$9.50.*

● **6800 SOFTWARE GOURMET GUIDE AND COOKBOOK** — BK1075 — Like its culinary cousin, *The 8080 Gourmet Guide*, this book by Scelbi Computing and Robert Findley describes sorting, searching and other routines — this time for the 6800 user. \$12.95.*

—COOK BOOKS—

● **CMOS COOKBOOK** — BK1011 — by Don Lancaster. Details the application of CMOS, the low power logic family suitable for most applications presently dominated by TTL. Required reading for every serious digital experimenter! \$10.50.*

● **TVT COOKBOOK** — BK1064 — by Don Lancaster. Describes the use of a standard television receiver as a microprocessor CRT terminal. Explains and describes character generation, cursor control and interface information in typical, easy-to-understand Lancaster style. \$9.95.*

● **TTL COOKBOOK** — BK1063 — by Donald Lancaster. Explains what TTL is, how it works, and how to use it. Discusses practical applications, such as a digital counter and display system, events counter, electronic stopwatch, digital voltmeter and a digital tachometer. \$9.50.*

"PRICES SUBJECT TO CHANGE WITHOUT NOTICE"

*Use the order card in the back of this magazine or itemize your order on a separate piece of paper and mail to Kilobaud Microcomputing Book Department • Peterborough NH 03458. Be sure to include check or detailed credit card information. No C.O.D. orders accepted. All orders add \$1.00 handling. Please allow 4-6 weeks for delivery. Questions regarding your order? Please write to Customer Service at the above address.

FOR TOLL FREE ORDERING CALL 1-800-258-5473

kb microcomputing book nook

BASIC AND PASCAL

NEW REVISED EDITION

● **PROGRAMMING IN PASCAL**—BK1140—by Peter Grogono. The computer programming language PASCAL was the first language to embody in a coherent way the concepts of structured programming, which has been defined by Edsger Dijkstra and C.A.R. Hoare. As such, it is a landmark in the development of programming languages. PASCAL was developed by Niklaus Wirth in Zurich; it is derived from the language ALGOL 60 but is more powerful and easier to use. PASCAL is now widely accepted as a useful language that can be efficiently implemented, and as an excellent teaching tool. It does not assume knowledge of any other programming language; it is therefore suitable for an introductory course. \$12.95.*

● **THE BASIC HANDBOOK**—BK1174—by David Lien. This book is unique. It is a virtual ENCYCLOPEDIA of BASIC. While not favoring one computer over another, it explains over 250 BASIC words, how to use them and alternate strategies. If a computer does not possess the capabilities of a needed or specified word, there are often ways to accomplish the same function by using another word or combination of words. That's where the HANDBOOK comes in. It helps you get the most from your computer, be it a "bottom-of-the-line" micro or an oversized monster. \$14.95.*

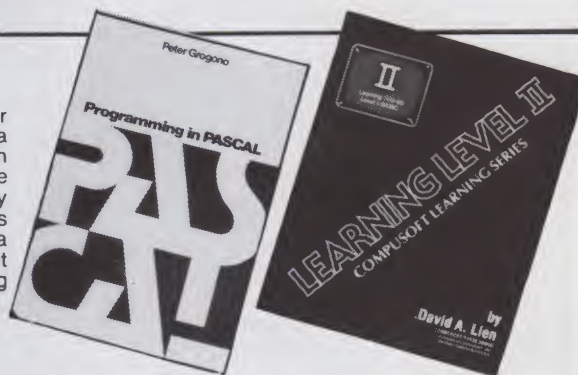
● **INTRODUCTION TO PASCAL**—BK1189—by Rodnay Zaks. A step-by-step introduction for anyone wanting to learn the language quickly and completely. Each concept is explained simply and in a logical order. All features of the language are presented in a clear, easy-to-understand format with exercises to test the reader at the end of each chapter. It describes both standard PASCAL and UCSD PASCAL, the most widely used dialect for small computers. No computer or programming experience is necessary. \$12.95.*

● **BASIC NEW 2ND EDITION**—BK1081—by Bob Albrecht. Self-teaching guide to the computer language you will need to know for use with your microcomputer. This is one of the easiest ways to learn computer programming. \$6.95.*

● **BASIC BASIC (2ND EDITION)**—BK1026—by James S. Coan. This is a textbook which incorporates the learning of computer programming using the BASIC language with the teaching of mathematics. Over 100 sample programs illustrate the techniques of the BASIC language and every section is followed by practical problems. This second edition covers character string handling and the use of data files. \$10.50.*

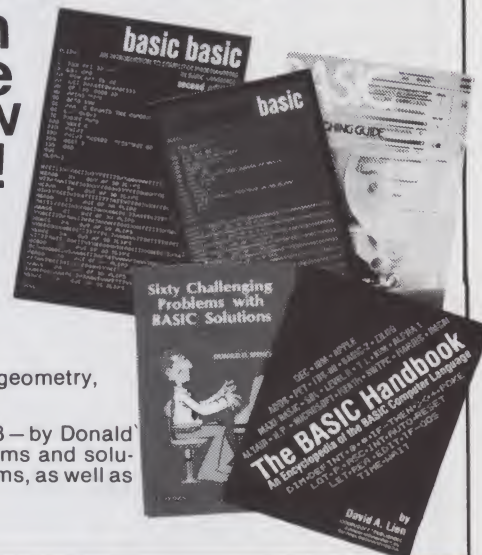
● **ADVANCED BASIC**—BK1000—Applications, including strings and files, coordinate geometry, area, sequences and series, simulation, graphing and games. \$10.75.*

● **SIXTY CHALLENGING PROBLEMS WITH BASIC SOLUTIONS (2nd Edition)**—BK1073—by Donald Spencer, provides the serious student of BASIC programming with interesting problems and solutions. No knowledge of math above algebra required. Includes a number of game programs, as well as programs for financial interest, conversions and numeric manipulations. \$6.95.*

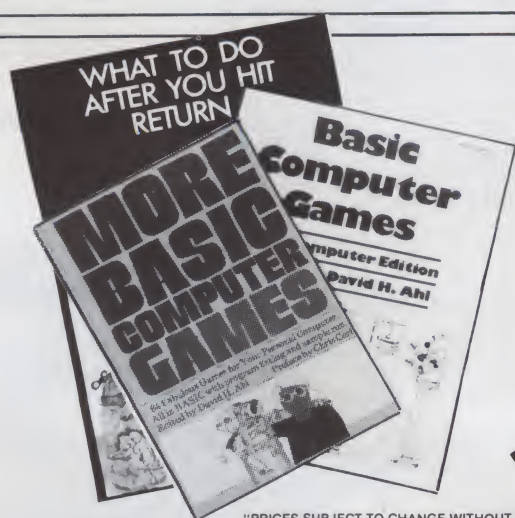


● **LEARNING LEVEL II**—BK1175—by David Lien. Written especially for the TRS-80, this book concentrates on Level II BASIC, exploring every important BASIC language capability. Updates are included for those who have studied the Level I User's Manual. Sections include: how to use the Editor, dual cassette operation, printers and peripheral devices, and the conversion of Level I programs to Level II. \$15.95.*

new!



GAMES



new!

● **WHAT TO DO AFTER YOU HIT RETURN**—BK1071—PCC's first book of computer games... 48 different computer games you can play in BASIC... programs, descriptions, many illustrations. Lunar Landing, Hammurabi, King, Civel 2, Qubic 5, Taxman, Star Trek, Crash, Market, etc. \$10.95.*

● **BASIC COMPUTER GAMES**—BK1074—Okay, so once you get your computer and are running in BASIC, then what? Then you need some programs in BASIC, that's what. This book has 101 games for you from very simple to real buggers. You get the games, a description of the games, the listing to put in your computer and a sample run to show you how they work. Fun. Any one game will be worth more than the price of the book for the fun you and your family will have with it. \$7.50.*

● **MORE BASIC COMPUTER GAMES**—BK1182—edited by David H. Ahl. More fun in BASIC! 84 new games from the people who brought you BASIC Computer Games. Includes such favorites as Minotaur (battle the mythical beast) and Eliza (unload your troubles on the doctor at bargain rates). Complete with game description, listing and sample run. \$7.50.*

"PRICES SUBJECT TO CHANGE WITHOUT NOTICE"

*Use the order card in the back of this magazine or itemize your order on a separate piece of paper and mail to Kilobaud Microcomputing Book Department
• Peterborough NH 03458. Be sure to include check or detailed credit card information. No C.O.D. orders accepted. All orders add \$1.00 handling.
Please allow 4-6 weeks for delivery. Questions regarding your order? Please write to Customer Service at the above address.

FOR TOLL FREE ORDERING CALL 1-800-258-5473

the CompuPro Systems Approach:

High Performance, High Throughput.

Unlike "all-in-one" computers, **CompuPro's** modular S-100 systems are amazingly flexible machines that are ideal for high level industrial, commercial, and scientific applications. Full conformance to all IEEE 696/S-100 specifications ensures well integrated systems performance, as well as freedom from obsolescence in the years to come.

All **CompuPro** products meet the most demanding mechanical and electrical standards, accept the highest possible clock speeds for maximum throughput, and are backed with one of the best - if not the best - warranties in the business (1 year limited warranty on all products, 2 year limited warranty with board exchange program for boards qualified under the Certified System Component program).

When you're looking for a computer, there are lots of choices. But when you need a precision machine that is built for the future as well as the present, the choice narrows down to the most experienced name in the S-100 business: **CompuPro**.

NEW! COMPUTER ENCLOSURE 2

Introductory price: \$795 (specify rack mount or desk top version)

Now it's easy to move up to an expandable S-100 system. . **COMPUTER ENCLOSURE 2** is ready to accept boards the minute it's unpacked. Fused, constant voltage power supply provides +8A at 25 Amps (!), +16V at 3 Amps, and -16V at 3 Amps. Also includes 20 slot shielded/active terminated motherboard, dual AC outlets on rear, heavy-duty line filter, circuit breaker, quiet ventilation fan, reset switch, and black anodized front panel (desktop version includes textured vinyl painted cover). Rack mount version includes slides for easy pull-out from rack frame.

Also available: **COMPUTER ENCLOSURE 1**. Same as above, but less power supply and motherboard. \$289 desktop, \$329 rack mount.

SYSTEM SUPPORT 1 MULTIFUNCTION BOARD

\$295 Unkit, \$395 A/T, \$495 CSC

This multi-purpose S-100 board provides your computer with the most needed system support functions - at less cost than buying numerous single function boards. Includes sockets for 4K of extended address EPROM or RAM (2716 pinout), 1 socket with battery backup; crystal controlled month/day/year/time clock with BCD outputs; optional high speed math processor (9511 or 9512); full RS-232 serial port; three 16 bit interval timers (cascade or use independently); two interrupt controllers service 15 levels of interrupts; power fail indicator with provision to switch CMOS memory to battery backup; and comprehensive owner's manual with numerous software examples. Conforms fully to all IEEE 696/S-100 standards.

Want to make your S-100 system more versatile? **System Support 1** is the answer. (Add \$195 to the above prices for the optional 9512 math processor.)

NEW LOWER PRICE ON 16K MEMORY EXPANSION-8 RAMS/\$35

Just what you would expect from the memory leader: top quality, low power, high speed (200 ns) 16K dynamic RAMs, backed up with a 1 year limited warranty. Expand memory in TRS-80* -I, -II and -III computers (Color model too) as well as machines made by Apple, Exidy, Heath H89, newer PETs, etc. Add \$3 for two dip shunts plus TRS-80* conversion instructions. Limited quantity.

S-100 HIGH PERFORMANCE MOTHERBOARDS

Actively terminated, fully shielded motherboards handle clock speeds up to 10 MHz. Unkits have edge connectors and termination resistors pre-soldered in place for easy assembly

20 slot motherboard with edge connectors - Unkit \$174, A/T \$214
12 slot motherboard with edge connectors - Unkit \$129, A/T \$169
6 slot motherboard with edge connectors - Unkit \$89, A/T \$129

OTHER S-100 BUS PRODUCTS

Active Terminator Board.....\$34.50 Kit
Memory Manager Board.....\$59 Unkit, \$85 A/T, \$100 CSC
Mullen Extender Board.....\$59 Kit
Mullen Relay/ Opto-Isolator Control Board.....\$129 Kit, \$179 A/T
Spectrum color graphics board.....\$299 Unkit, \$399 A/T, \$499 CSC
2708 EPROM Board (2708s not included).....\$85 Unkit, \$135 A/T, \$195 CSC
Interfacer 1 (dual RS-232 serial ports).....\$199 Unkit, \$249 A/T, \$324 CSC
Interfacer 2 (3 parallel + 1 serial port).....\$199 Unkit, \$249 A/T, \$324 CSC

LEGAL CORNER Z80A is a registered trademark of Zilog, TRS-80 is a trademark of the Tandy Corporation, PASCAL M is a trademark of Sorcim, CP/M is a registered trademark of Digital Research

HIGH SPEED S-100 CPU BOARDS 8 BIT CPU Z

Like many others, we claim full conformance to IEEE 696/S-100 specifications: unlike many others, we'll send you the timing specs to prove it. **CPU Z** includes all standard Z-80A* features along with power on jump, on-board fully maskable interrupts for interrupt-driven systems, selectable automatic wait state insertion, provision for adding up to 8K of on-board EPROM, and 16/24 bit extended addressing. Works with 6 MHz CPUs; supplied with 4 MHz CPU. \$225 Unkit, \$295 A/T, \$395 CSC.

16/8 BIT CPU 8085/88

The only board that bridges the 8 bit world of the present and the 16 bit world of the future. By using an 8088 CPU (for 16 bit power with a standard 8 bit bus) in conjunction with an 8 bit 8085, **CPU 8085/88** is downward compatible with 8080/8085 software, upward compatible with 8086/88 software (as well as Intel's coming P-Series), designed for professional-level high speed applications, and capable of accessing 16 megabytes of memory. . while conforming fully to all IEEE 696/S-100 standards (timing specs available on request).

Looking for a powerful 8 bit CPU board? Looking for a powerful 16 bit CPU board? Then look at **CPU 8085/88**, the best of both worlds.

Prices: \$295 Unkit, \$425 A/T (both operate at 5 MHz); \$525 CSC (with 5 MHz 8085, 6 MHz 8088). Owner's manual available separately for \$5.

8 BIT CPU 8085

This is a single 8 bit processor version of the above board, and may be easily upgraded to full 16 bit operation at a later date. \$235 Unkit, \$325 A/T, \$425 CSC.

SOFTWARE

8088/8086 MONITOR-DEBUGGER: \$35

Supplied on single sided, single density, soft-sector 8" disc. CP/M* compatible. Great development tool; mnemonics used in debug conform as closely as possible to current CP/M* DDT mnemonics.

PASCAL/M* FROM SORCIM: \$175 COMPLETE

PASCAL - easy to learn, easy to apply - can give a microcomputer with CP/M* more power than many minis. We supply a totally standard **Wirth PASCAL/M* 8" diskette** and comprehensive manual. Specify Z-80* or 8080/8085 version.

S-100 MEMORIES

CompuPro memories feature fully static design to eliminate dynamic timing problems, full conformance to all IEEE 696/S-100 specifications, high speed operation (4/5 MHz Unkit, 10 MHz A/T and CSC), low power consumption, extensive bypassing, and careful thermal design.

	Unkit	A/T	CSC
8K RAM 2A.....	\$159	\$189	\$239
16K RAM 14 (extended addressing).....	\$279	\$349	\$429
16K RAM 20-16 (extended addressing and bank select).....	\$319	\$399	\$479
24K RAM 20-24 (extended addressing and bank select).....	\$429	\$539	\$629
32K RAM 20-32 (extended addressing and bank select).....	\$559	\$699	\$799
128K RAM 21-128 (extended addressing).....	n/a	n/a	\$2795

Most **CompuPro** products are available in **Unkit** form, **Assembled/Tested**, or qualified under the high-reliability **Certified System Component (CSC)** program (200 hour burn-in, more). **Note:** **Unkits** are not intended for novices, as de-bugging may be required due to problems such as IC infant mortality. Factory service is available for **Unkits** at a flat service charge.

TERMS: Prices shown do not include dealer installation and support services. Cal res add tax. Allow at least 5% shipping; excess refunded. Orders under \$15 add \$2 handling. VISA and Mastercard - orders (\$25 min) call our 24 hour order desk at (415) 562-0636. Include street address for UPS delivery. Prices are subject to change without notice.

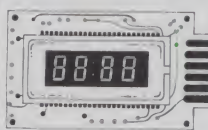
FREE CATALOG: Want more information? Then send for our free catalog. For fast 1st class delivery, add 41 cents in stamps; foreign orders add \$2 (refundable with order).

CompuProTM
OAKLAND AIRPORT, CA 94614

division of
(415) 562-0636

GODBOUT
ELECTRONICS
✓42

**COMPUPRO PRODUCTS ARE AVAILABLE AT COMPUTER STORES
WORLD-WIDE. . .CALL (415) 563-0636 FOR THE STORE NEAREST YOU.**



12VDC AUTOMOTIVE/INSTRUMENT CLOCK
APPLICATIONS:
• In-dash auto clocks
• After-market auto/RV clocks
• Aircraft-marine clocks
• 12VDC oper. instrmts.
• Portable/battery powered instrmts.

Features: Bright 0.3" green display. Internal crystal time-base, ± 0.5 sec./day accur. Auto display brightness control logic. Display color filterable to blue, blue-green, green & yellow. Complete—just add switches and lens.

MA1003 Module \$16.95

MA1023 .7" Low Cost Digital LED Clock Module \$9.95

MA1026 .7" Dig. LED Alarm Clock/Thermometer \$8.95

MA5036 .3" Low Cost Digital LED Clock/Timer \$6.95

MA1002 .5" LED Display Dig. Clock & Xformer \$9.95



RAM SALE

MM5290N-4 (MK4116/UPD416) . . . \$4.95 each

16K DYNAMIC RAM (250NS)
(8 EACH \$39.95) (100 EACH \$450.00/lot)

MM5290J-2 (MK4116/UPD416) . . . \$6.95 each

16K DYNAMIC RAM (150NS)
(8 EACH \$49.95) (100 EACH \$550.00/lot)

MM5298J-3A \$3.25 each

8K DYNAMIC RAM (LOW HALF OF MM5290J) 200NS
(8 EACH \$23.95) (100 EACH \$250.00/lot)

MM2114-3 \$5.95 each

4K STATIC RAM (300NS)
(8 EACH \$43.95) (100 EACH \$450.00/lot)

MM2114L-3 \$6.25 each

4K STATIC RAM (LOW HALF OF MM5290J) 200NS
(8 EACH \$44.95) (100 EACH \$475.00/lot)

EPROM Erasing Lamp



- Erases 2708, 2716, 1702A, 5203Q, 5204Q, etc.
- Erases up to 4 chips within 20 minutes.
- Maintains constant exposure distance of one inch.
- Special conductive foam liner eliminates static build-up.
- Built-in safety lock to prevent UV exposure.
- Compact—only 7-5/8" x 2-7/8" x 2".
- Complete with holding tray for 4 chips.

UVS-11E \$79.95

Jumbo 6-Digit Clock Kit

- Four .630"ht. and two .300"ht. common anode displays
- Uses MM5314 clock chip
- Switches for hours, minutes and hold functions
- Hours easily viewable to 30 feet
- Simulated walnut case
- 115VAC operation
- 12 or 24 hour operation
- Includes all components, case and wall transformer
- Size: 6 3/4" x 3-1/8" x 1 1/4"

JE747 \$29.95

6-Digit Clock Kit

- Bright .300 ht. comm. cathode display
- Uses MM5314 clock chip
- Switches for hours, minutes and hold modes
- Hrs. easily viewable to 20 ft.
- Simulated walnut case
- 115 VAC operation
- 12 or 24 hr. operation
- Incl. all components, case & wall transformer
- Size: 6 3/4" x 3-1/8" x 1 1/4"

JE701 \$19.95

Regulated Power Supply

Uses LM309K. Heat sink provided. PC board construction. Provides a solid 1 amp @ 5 volts. Can supply up to $\pm 5V$, $\pm 9V$ and $\pm 12V$ with JE205 Adapter. Includes components, hardware and instructions. Size: 3 3/4" x 5" x 2 1/4"

JE200 \$14.95



ADAPTER BOARD
—Adapts to JE200—
 $\pm 5V$, $\pm 9V$ and $\pm 12V$

DC/DC converter with +5V input. Toroidal hi-speed switching XFMR. Short circuit protection. PC board construction. Piggy-back to JE 200 board. Size: 3 3/4" x 2" x 9/16"H

JE205 \$12.95

MICROPROCESSOR COMPONENTS

8080A/8080A SUPPORT DEVICES

INS8080A	CPU	6.50
DP8212	8-Bit Input/Output	3.25
DP8214	Priority Interrupt Control	3.50
DP8216	Bi-Directional Bus Driver	3.49
DP8224	Bus Driver	3.49
DP8226	System Controller/Bus Driver	4.95
DP8228	System Controller	4.95
INS8243	I/O Expander for 8 Series Asynchronous Comm. Element	36.95
DP8251	Prog. Comm. I/O (USART)	3.95
DP8253	Prog. Interval Timer	3.95
DP8255	Prog. Peripheral I/O (PPI)	3.95
DP8257	Prog. DMA Control	19.95
DP8259	Prog. Interrupt Control	19.95
DP8275	Prog. CRT Controller	49.95
DP8279	Prog. Keyboard/Display Interface	49.95
DP8300	Octal Bus Receiver	4.95
DP8303	System Timing Element	3.95
DP8304	8-Bit Bi-Directional Receiver	6.95
DP8307	8-Bit Bi-Directional Receiver	6.95
DP8308	8-Bit Bi-Directional Receiver	3.95

6800/6800 SUPPORT DEVICES

MC6800	MPU	14.95
MC6802CP	MPU with Clock and RAM	4.95
MC6801AP1	128x4 Static RAM	4.95
MC6802	Peripheral Inter. Adapt (MC6820)	7.49
MC6808	Priority Interrupt Controller	14.95
MC6830L8	1024x8 RDM (MC68A30-8)	14.95
MC6850	Asynchronous Comm. Adapter	6.95
MC6802	Synchronous Serial Data Adapter	10.95
MC6800	9000bps Digital MODEM	12.95
MC6802	2400bps Modulator	12.95
MC6808A	Quad 3-State Bus Trans. (MC68T36)	2.95

MICROPROCESSOR CHIPS

280 (780C)	CPU (MK380N) (2M+12)	13.95
280A (780-1)	CPU (MK380N-4) (4M+12)	13.95
CDP1802	CPU	16.95
7550	MPU	19.95
IDM260ADC	CPU—8-Bit Static (Com. Temp. Grade)	19.95
INS8038N-4	MPU w/Clock (8K Bytes Memory)	11.95
INS8038N-4	CPU—8-Bit (6M+12)	16.95
INS8038N-4	CPU—Seri. Chip 8-Bit (128bytes RAM)	19.95
INS8038N-4	CPU (256 Bytes RAM)	24.95
INS8038N-4	CPU—64 Bytes RAM	24.95
INS8038N-4	CPU w/BASIC Micro Interpreter	29.95
INS8038N-4	CPU—16-Bit	19.95
INS8038N-4	CPU—16-Bit	19.95
INS8038N-4	CPU—16-Bit	19.95

SHIFT REGISTERS

MM5008	Dual 8-Bit Dynamic	50
MM5008	Dual 8-Bit Static	50
MM5008	Dual 8-Bit Accumulator	50
MM1402	256-Bit Dynamic	3.95
MM5013	1024-Bit Dynamic/Accumulator	1.95
MM5014	512-Bit Dynamic	89
MM5034N	Octal 80-Bit	9.95
MM5035N	Octal 80-Bit	9.95
7504 (760A)	1024-Bit Dynamic	3.95
7518N	Hex 32-Bit Dynamic	2.95
7520V	Dual 132-Bit Static	2.95
7524V	512-Bit Dynamic	99
7525V	1024-Bit Dynamic	2.95
7527V	Dual 256-Bit Static	2.95
7528V	Dual 512-Bit Static	4.00
7529V	Dual 240-Bit Static	4.00
8322N	Quad 80-Bit Static	2.95
LM1402	Fifo (Dual 80)	6.95

DATA ACQUISITION

AF100-1CN	Universal Active Filter 2.5K	3.95
AF121-1CJ	Touch Tone Low Pass Filter	19.95
AF121-1CJ	Touch Tone Low Pass Filter	19.95
LM1342	Super Guard Amp	1.00
LM1342	Constant Current Source	1.00
LM1352	Temperature Transducer	1.10
JF135T	JFET Input Amp	1.40
LF 308N	Sample & Hold Amplifier	3.95
LM399H	Temp. Comp. Prec. Ref. (Spm/C)	1.10
AD0808MLCN	8-Bit A/D Converter (1.5LSB)	4.95
AD0808MLCN	8-Bit D/A Converter (0.78% Lin.)	2.25

DATA ACQUISITION (CONTINUED)

AD0808MLCN	8-Bit A/D Converter (8-Ch. Multi.)	5.25
AD0808MLCN	8-Bit A/D Converter (16-Ch. Multi.)	10.95
AD0808MLCN	10-Bit D/A Conv. Micro. Comp. (0.25%)	13.95
AD0808MLCN	10-Bit D/A Conv. Micro. Comp. (0.25%)	8.95
AD0808MLCN	10-Bit D/A Converter (0.05% Lin.)	8.49
AD0808MLCN	10-Bit D/A Converter (0.25% Lin.)	5.95
AD0808MLCN	12-Bit D/A Converter (0.25% Lin.)	9.95
AD0808MLCN	8-Channel Multiplexer	1.19
AD0808MLCN	30K BAUD UART	5.95

RAM'S

1101	256x1 Static	1.49
1103	1024x1 Dynamic	99
2101 (8101)	256x4 Static	3.95
2102	1024x1 Static	1.75
2110	256x4 Static	1.95
2111 (8111)	256x4 Static MDS	4.95
2112	1024x4 Static 400ns	5.90
2114	1024x4 Static 400ns Low Power	6.95
2114-3	1024x4 Static 300ns	7.49
2114-3	1024x4 Static 300ns Low Power	7.95
4116 (UPD416)	16-384x1 Dynamic 500ns (house marked)	4.95
4116 (UPD416)	8K Dynamic 250ns	19.95
MM2142J	4096x1 Fast 70ns	19.95
5101	256x4 Static	7.95
MM5261	1024x1 Dynamic Fully Decoded	3.95
MM5262	2Kx1 Dynamic	3.95
MM5262/2367	4096x1 Dynamic	29
MM5262/24136	8K Dynamic 150ns (UPD416)	6.95
MM5262/3A	8K Dynamic (lower 1/4 of MM5262)	4.95
7489	16x4 Static	1.75
UPD416/4M4027	4K Dynamic 16-pin	4.95
TM5404A-40V	4K Static	14.95
TM5404S	1024x4 Static	14.95

PROMS/EPROMS

1702A	2K UV Erasable PROM	5.95
2708	8K EPROM	5.95
TM52716	8K EPROM (+5V, +5V, +12V)	19.95
2716/1601(2516)T1	8K EPROM (Single +5V)	17.95
2716/1601(2516)T1	8K EPROM (Single +5V)	49.95
2758	8K EPROM (400ns) (Single +5V)	7.95
5203	2048 PROM	14.95
8252/74S158B	32x4 PROM (Open Collector)	4.95
82515	4096 Bipolar PROM	19.95
82512/74S158B	32x4 Tri-State Bipolar PROM	4.95
82516	8K PROM	29.95

ROM'S

2613(2140)	Character Generator (Upper Case)	9.95
2613(2021)	Character Generator (Lower Case)	9.95
2616N	Character Generator (Lower Case)	10.95
MM5230N	2048-Bit Read Only Memory	1.95

NMOS READ ONLY MEMORIES

MC166160P	128x8x7 ASCII Shifted w/Greek	13.50
MC166160P	128x8x7 Math Symbol & Pictures	13.50
MC166160P	128x8x7 Alpha, Control Char. Gen.	13.50

MICROPROCESSOR MANUALS

M-780	User Manual	7.50
IN-CDP1802	User Manual	5.00
M-2600	User Manual	5.00

SPECIAL FUNCTION

DS0002CN	Dual MOS Clock Driver (BM2)	3.50
DS0002CN	Dual MOS Clock Driver (BM2)	1.95
INS1771N-1	Flopless Div. Controller	24.95
INS5861N	Communication Chip	19.95
INS5861N	Microprocessor Real Time Clock	8.95
INS5861N	Microprocessor Compable Clock	11.95
MM5814N	Microcontroller with 64-Digit RAM	6.95
CDP4022N	end Direct LED Drive	7.49
CDP4022N	Microcontroller with 64-Digit RAM	7.49
CDP4022N	end Direct LED Drive w/N Bus Int.	7.49
COP407N	25-Seg. VAC Fluor. Driver (20-pin pkg.)	3.25

TELEPHONE/KEYBOARD CHIPS

AY-54100	Push Button Telephone Dialer	14.95
AY-54100	Push Button Telephone Dialer	14.95
AY-54100	CMOS Clock Generator	4.95
AY-54100	Keyboard Encoder (8 keys)	11.95
AY-54100	Keyboard Encoder (16 keys)	7.95
AY-54100	Keyboard Encoder (16 keys)	5.49
AY-54100	Keyboard Encoder (20 keys)	5.75
MM5310N	Push Button Pulse Dialer	7.95
MM5310N	16/14-Key Serial Keyboard Encoder	8.95

DESIGNERS' SERIES

Blank Desk-Top Electronic Enclosures



- High strength epoxy molded end pieces in mocha brown finish.
- Sliding rear/bottom panel for service and component accessibility.
- Top/bottom panels .080 thk alum. Alodine type 1200 finish (gold tint color) for best paint adhesion after modification.
- Vented top and bottom panels for cooling efficiency.
- Rigid construction provides unlimited applications.

CONSTRUCTION:

The "DTE" Blank Desk Top Electronic Enclosures are designed to blend and complement today's modern computer equipment and can be used in both industrial and home. The end pieces are precision molded with an internal slot (all around) to accept both top and bottom panels. The panels are then fastened to 1/4" thick tabs inside the end pieces to provide maximum rigidity to the enclosure. For ease of equipment servicing, the rear/bottom panel slides back on slotted tracks while the rest of the enclosure remains intact. Different panel widths may be used while maintaining a common profile outline. The molded end pieces can also be painted to match any panel color scheme.

Enclosure Model No.	Panel Width	PRICE
DTE-8	8.00"	\$29.95
DTE-11	10.65"	\$32.95
DTE-14	14.00"	\$34.95

\$10.00 Min. Order — U.S. Funds Only
Calif. Residents Add 6% Sales Tax
Postage — Add 5% plus \$1 Insurance

Jameco ELECTRONICS
MAIL ORDER ELECTRONICS — WORLDWIDE
1355 SHOREWAY ROAD, BELMONT, CA 94002
PRICES SUBJECT TO CHANGE

Spec Sheets — 25¢
Send 41¢ postage for your
FREE 1981 JAMECO CATALOG

PHONE ORDERS WELCOME
(415) 592-8097

JOYSTICKS



JS-5K 5K Linear Taper Pots \$5.25
JS-100K 100K Linear Taper Pots \$4.95
JVC-40 40K (2) Video Controller in case \$5.95

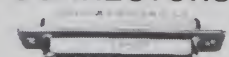
AC and DC Wall Transformers



Ideal for use with clocks, games, power supplies or any other type of AC or DC application.

Part No.	Input	Output	Price
AC 250	117V/60Hz	12 VAC 250mA	\$3.95
AC 500	117V/60Hz	12 VAC 500mA	\$4.95
AC 1000	117V/60Hz	12 VAC 1 amp	\$5.95
DV9200	117V/60Hz	9 VDC 200mA	\$3.25
DC 900	120V/60Hz	9 VDC 500mA	\$3.95

CONNECTORS



DB25P	D-Subminiature Plug	\$2.95
DB25S	D-Subminiature Socket	\$3.50
DB15/226	Cover for DB25P/S	\$1.75
22/44SE	P.C. Edge (22/44 Pin)	\$2.95
UG88/U	BNC Plug	\$1.79
UG89/U	BNC Jack	\$3.79
UG175/U	UHF Adapter	\$ 49
SO239	UHF Panel Recp.	\$1.29
PL258	UHF Adapter	\$1.60
PL259	UHF Plug	\$1.60
UG260/U	BNC Plug	\$1.50
UG1094/U	BNC Bulkhead Recp.	\$1.29

TRS-80

16K Conversion Kit

Expand your 4K TRS-80 System to 16K.
Kit comes complete with:
• 8 ea. MM5290 (UPD416/4116) 16K Dyn. Rams (*NS)
• Documentation for Conversion

TRS-16K2 *150NS \$49.95

TRS-16K4 *250NS \$39.95

JE610 ASCII

Encoded Keyboard Kit



7400



554

1000

BILITY

THESE PROMS	
CA3089N	3.75
CA3096N	3.95
CA3130H	1.35
CA3140H	1.25
CA3160H	1.25
CA3401N	.55
CA3600N	3.50

CD4082 .3

DISCRETE LEDS		
		
XC556R .200" red 4/s	MV50 .085" red 5/s	XC118R .190" red 4/s
XC556R .200" green 4/s	XC209R .125" red 5/s	XC118R .190" green 4/s
XC556Y .200" yellow 4/s	XC209G .125" green 4/s	XC119Y .190" yellow 4/s
XC556C .200" clear 4/s	XC209R .125" yellow 4/s	XC118C .190" clear 4/s
XC221R .200" red 4/s	XC368R .125" green 4/s	
XC222G .200" green 4/s	XC526G .185" green 4/s	
XC222Y .200" yellow 4/s	XC526Y .185" yellow 4/s	
MV10B .100" red 4/s	XC526C .185" clear 4/s	

BIOBLAN LERO[illegible][illegible]

(GOLD) LEVEL #3

40 pin SG	1.75	1.59	1.45	40 pin WW	2.29	2.09	1.95
-----------	------	------	------	-----------	------	------	------

Part No.	Function	Price
70651PI	CMOS Precision Timer	14.95
7065EV/Kit*	Stopwatch Chip, XTL	22.95
71061C	3 1/2 Digit A/D (LCD Drive)	16.95
7106EV/Kit*	IC, Circuit Board, Display	34.95
7107CPL	3 1/2 Digit A/D (LED Drive)	15.95
7107EV/Kit*	IC, Circuit Board, Display	28.95
71161C	3 1/2 Digit A/D LCD D.P. & H.L.D.	17.95
7117CPL	3 1/2 Digit A/D LED D.S. H.L.D.	17.95
72011DR	Low Battery Volt Indicator	2.25
72061PG	CMOS LED Stopwatch/Timer	12.95
7206EV/Kit*	Stopwatch Chip, XTL	19.95
72061CPE	Tone Generator	5.15
7206CEV/Kit*	Tone Generator Chip, XTL	9.95
7207A1PD	Oscillator Controller	4.50
7207AEV/Kit*	Freq. Counter Chip, XTL	17.95
72081PI	Seven Decade Counter	17.95
72091PA	Clock Generator	3.95
72151PG	4 Func. CMOS Stopwatch CXT	13.95
7215EV/Kit*	4 Func. Stopwatch Chip, XTL	19.95
72161C	8-Digit Univ. Counter C.A.	32.00
72161CJ1	8-Digit Freq. Counter C.A.	26.95
72161DIPI	8-Digit Freq. Counter C.C.	21.95
72171J1	4-Digit LED Up/Down Counter	12.95
72181CJ1	8-Digit Univ. LED Drive	10.95
72241PL	LCD 4 1/2 Digit Up Counter DRI	11.25
72261AJ1	8-Digit Univ. Counter	31.95
7226AEV/Kit*	5 Function Counter Chip, XTL	74.95
72401JE	CMOS Bin Prog. Timer/Counter	4.95
72421C	CMOS Divide-by-256 RC Timer	2.05
72501JE	CMOS BCD Prog. Timer/Counter	6.00
72601JE	CMOS BCD Prog. Timer/Counter	5.25
75551PA	CMOS 555 Timer (8 pin)	1.45
75561C	CMOS 556 Timer (14 pin)	2.00
7611BCPA	CMOS Op Amp Comparator	5MV 2.25
7612BCPA	CMOS Op Amp Ext. Cmvr.	5MV 2.95
7621BCPA	CMOS Dual Op Amp Comp.	5MV 3.50
7631CPC	CMOS Tri Op Amp Comp.	10MV 3.95
7641CCPD	CMOS Quad Op Amp Comp.	10MV 7.50
7642CCPD	CMOS Quad Op Amp Comp.	10MV 7.50
7660CPA	Voltage Converter	2.95
800pm	Band-GAP Volt Ref. Diode	2.50
8211CPA	Volt Ref/Indicator	2.50
8212CPA	Volt Ref/Indicator	2.50

* INTERSIL'S EVALUATION KITS

14030	1107	14030	1107	14030	1107
14030	1107	14030	1107	14030	1107

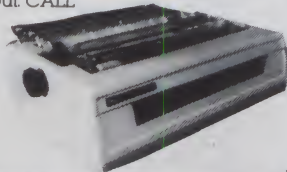
LM309K	1.25	LM359N	1.79	LM1556V	1.75
--------	------	--------	------	---------	------

LM340K-12	1.35	LM567V	1.25	75451CN	.39
-----------	------	--------	------	---------	-----

10 DAY FREE RETURN

NEC THE FIRST NAME IN LETTER QUALITY PRINTERS.

CompuMart offers beautiful print quality with NEC Spinwriter terminals. Both KSR and RO versions give unsurpassed hard copy output. CALL.



CENTRONICS PRINTERS

The incredible Model 737. The closest thing to letter quality print for under \$1,000.

737-1 (Parallel Interface) — \$899.

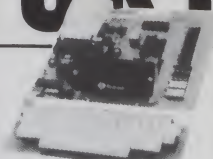


COMMODORE

COMPUMART has delivered more Commodore computers in the U.S. than any other dealer. Call us now for low prices and special deals. **NEW FOR PET:**

Visicalc (Need 32K & a disk drive) \$199. - Word Pro I. \$29.95 - Word Pro 2. \$99.95 - Word Pro 3. \$199.95 - Word Pro 4. \$299.95.

Educators Take Note! Commodore has extended its 3 for 2 deal until 6-30-81. This means that any educational institution which buys two Commodore computers will receive a third absolutely **FREE**. Call our sales department for complete details.



COMPUMART's Microflex 65 System for your AIM includes. Adapter Buffer Module w/4-slot module stack, 8K RAM module, 16K PROM/ROM module, Asynchronous communications Interface, and Power Supply \$1,299. Call or write for our complete Microflex 65 brochure.

ROCKWELL AIM 65

Our AIM system includes 4K AIM with BASIC interpreter assembler, Power Supply, Cassette recorder & Enclosure \$799. 4K AIM-65 \$499. PL65 High Level Language \$125. Paper for the AIM (roll) \$250. Rockwell's 4-slot Motherboard (sale) \$175.

NEW FROM INTEGRAL DATA—THE IDS 560 PRINTER. 132 column graphics printer. \$1,695

IDS 445. Priced lower than the 440 and equipped with a better print head. IDS 445 w/graphics \$894. IDS 445 w/o graphics \$795.

IDS 460 \$1,295

The 460's features include: Correspondence quality printing, high resolution graphics capability, programmable print justification.



Omni Printers from Texas Instruments

The 810 — List \$1895. **SALE! \$1795.** The 820 (Ro) Package — Includes machine-mounted paper tray and cable. A compressed print option and device forms control are standard features. \$2,155.

The 820 (KSR) Package — Includes full ASCII Keyboard plus all of the features on the RO \$2395.

NEW! The PMC-80. The new computer that's software compatible with the TRS-80. Level II 16K at \$645.

ACCESSORIES FOR PMC — 80 EXP-100 S-100 Bus Expander \$410. Disk Printer, RS232 I/O \$410. S-32K S-100 Bus 32K RAM Board for EXP-100 \$295.

CAB-40 Cable 12" long ribbon cable for EXP-100 \$25.



Dysan Diskettes — Single side, Single density, Hard or Soft Sector \$5. ea.

Memorex 3401's — 5 1/4 discs \$3.25 with hub ring for Apple \$3.50.

Memory Integrated Circuits — Call for qty. discounts when ordering over 50 units.

Motorola 4116 (200 Nanosecond, Plastic) \$4.50 ea. **Fairchild 2114** (Standard Power, Plastic) \$4.50 ea.

COMPUMART stocks the complete line of **MATROX PRODUCTS**. Call for specs.

COMPUMART now offers the ENTIRE **DEC LSI-11 PRODUCT LINE**. Call for prices & delivery.

NOVATION CAT™ ACOUSTIC MODEM

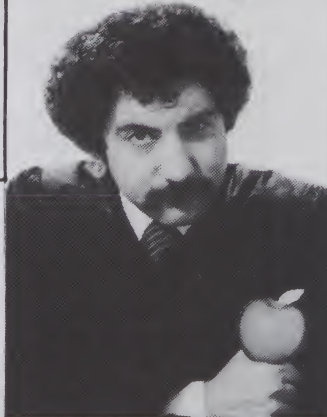
Answer Originate, 300 Baud, Bell 108, Low Profile Design. \$179.00

NEW! D-CAT Direct Coupler from Novation \$199.

Visit our giant

ANN ARBOR STORE

1250 North Main Street
Ann Arbor, Michigan



SEND FOR OUR FREE CATALOG

Super Selling Terminals

We have the following **Lear Siegler** Terminals in stock at prices too low to print — Call for quotes.

ADM — 3A Industries favorite dumb terminal for some very smart reasons.

ADM — 3A + NEW from Lear Siegler. CALL IT IS HERE! — It is the new Intermediate Terminal from Lear Siegler. Call for details.



HP-41C Calculator..... \$239.00
Memory Modules. For storing programs or up to 2,000 lines of program memory \$29.95

"Extra Smart" Card Reader. Records programs and data back onto blank magcards. \$199.00

The Printer. Upper and Lower case. High resolution plotting. Portable Thermal operation..... \$355.00
Application Modules \$29.95

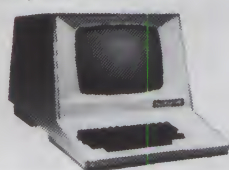
NEW SUPER 41-C Systems with Quad RAMS built-in. (Maximum memory on-board leaves slots open for Application Pacs and peripherals. The HP 41C-C \$325.00 HP 41C-C Plus Card Reader \$495.00

HP 41C-C Plus Card Reader & Printer \$845.00
Quad RAMS for the 41-C (Equivalent to four Memory Modules all packed into one) \$95.00



We have the following best-selling Hazeltine terminals in stock at prices much too low to print.

(4110, 1420, 1500, 1520, 1552)
Call COMPUMART Now for our lowest prices ever.



HP-85

Hewlett-Packard's Personal Computer for Industry. This extremely portable computer features extended BASIC to solve your problems quickly and efficiently along with an advanced graphics system to enhance communication.

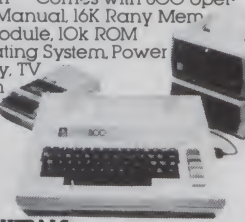
HP-85 ACCESSORIES

We carry HP Peripherals (Disk Drives to Graphics Plotters), Enhancements (BASIC Training, General Statistics, Financial Decision, Math, Linear Programming \$95 ea.), HP-85 Accessories (Enhancement ROMs, ROM drawer, Overhead Transparency Kit), Supplies (Plotter Pens, Tape Cartridges), Interface Modules (HP-IB Interface, HP-IB Interconnect Cables, Serial (RS-232C) Interface Module).

We can get your every HP peripheral made for the HP-85. **CALL FOR COMPLETE DETAILS & SPECS.**

COMPUMART exclusive ATARI SPECIALS

ATARI 800 Personal Computer System — Comes with 800 operators Manual, 16K Rany Memory module, 10K ROM Operating System, Power Supply, TV Switch Box \$950.



PERIPHERALS

Atari 410 Program Recorder \$89.95

Atari 810 Disk Drive (SI00 off with purchase) \$699.95
NEW Dual Disk double density \$1499.95

825 Printer (Centronics 737) \$995.00

RS232 Interface w/Cable \$249.95
NEW! Light Pens \$74.95

NEW! Visicalc for Atari \$199.00

Educators Take Note. Atari has extended its 3 for 2 deal until 6-30-81. Any educational institution that buys two Atari 800's will receive an Atari 400 computer absolutely **FREE**. Call our sales dept. for complete details.

EXCLUSIVE from COMPUMART Special Offer. Zenith Color Video Monitor for \$379!

NEW FROM SANYO — Four Great Monitors at Low COMPUMART Prices. Sanyo's new line of CRT data display monitors are designed for the display of alphanumeric or graphic data.

9" Sanyo Monitor \$169.00
12" Sanyo Monitor \$269.00
12" Sanyo Monitor with green screen \$299.00
13" Sanyo Color Display Monitor

IMPORTANT ORDERING INFORMATION All orders must include 4% shipping and handling. Mass. residents add 5% sales tax. Michigan residents 4% for sales tax. Phones open from 8:30 a.m. to 7:00 p.m., Mon-Fri; 11:00 a.m. to 4:00 p.m. Sat. P.O.'s accepted from Dun & Bradstreet rated companies — shipment contingent upon receipt of

signed purchase order. Sale prices valid for month of magazine date only — all prices subject to change without notice. Our Ann Arbor retail store is open 11:00 a.m. to 7:00 p.m. Tues.-Fri., 10:00 a.m. to 5:00 p.m. Saturdays.

APPLE II

We carry the most complete inventory of Apple computers, peripherals, and software. **CALL!** **Our Best Selling Apple System. Save over \$250** on our most popular Apple System. System includes a 48K Apple II, Apple Disk, DOS3.3, & Controller, and a Sup R. Mod RF Modulator.

List: \$2120
COMPUMART Sale Price: \$1875.

SOFTWARE FROM APPLE

Apple Plot. The perfect graphic complement for Visicalc. **\$70**
Dow Jones News & Quotes **\$95**
Adventure (Uses 48K) **\$35**
DOS Tool Kit **\$75**
Apple Fortran **\$200**
Tax Planner **\$120**

FROM PERSONAL software

Visicalc **\$149**
Desk Top Plan **\$99**
NEW FROM MUSE
The Voice **\$39.95**
Super Text **\$99.00**
Address Book **\$49.95**

Miscellaneous Apple II

Accessories:
Easy Writer (80 col. need a Videx) **\$249**
Easy Mover **\$49**
Easy Mailer **\$69**

NEW from Apple for the Apple II.

Dos 3.3 Convert disks to 16 sector format for 23% more storage and faster access **\$60.**

NEW for the Apple II

From MicroSoft **\$195.00**
16K RAM Board **\$175.00**
FORTRAN **\$750.00**
COBOL **\$750.00**
Card Reader from Mountain Hardware **\$1,195.00**
Hi-Res Dump for 460 Printer from the Computer Station **\$49.95**

HARDWARE ACCESSORIES FOR APPLE

Silentype Printer w/x face **\$635**
Super Sound Generator (mono) **\$259**
\$159 (stereo) **\$249**
Light Pen **\$249**
X-IO Controller (plugs into parallel port) **\$49**

Mountain Computer — Expansion accessories for your Apple

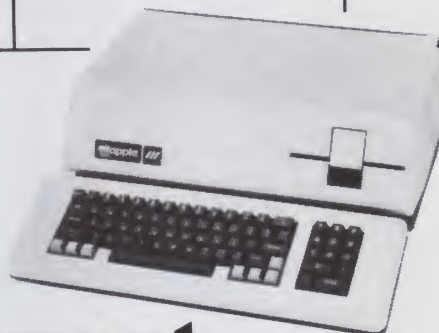
Introl — IO System **\$289**
Super Talker **\$299**
The Music System **\$545**
ROM plus board w/Keyboard filter **\$199**
Clock Calendar **\$280**
16 Channel A to D Converter **\$350**
Apple Expansion Chassis **\$650**
ROM Writer **\$175**

From VIDEKI—Video Term.

80 Col. x 24 line, 7 x 9 Matrix plug in compatible board for the Apple II Price **\$325** without graphics EPROM. With graphics EPROM **\$350.**
S.S.M. Serial & Parallel Apple Interface **\$225**
ABT's Numeric Key Plan **\$110**
California Microcomputer Keyboard **\$195**

Apple III

Space won't allow us to give you the details and specs on this already famous new computer. Call our expert sales force today for full details — they can answer any questions. We have **complete system packages in stock.** COMPUMART carries all **Apple III related software and hardware.** If you need an Apple III call COMPUMART now.



Apple III In Stock Now for Immediate Shipment.

COMPUMART has been serving the computer needs of industry since 1971.

We stock, for immediate shipment, only those products from the finest micro-computer manufacturers.

And any product, except software, can be returned within 10 days for a full refund — even if you just change your mind.

We also honor all manufacturers' warranties. Our expert technicians will service any product we sell that cannot be better, or faster, serviced by the manufacturer's local service center.



Call us for more information on products, product configuration and service. Our phones are open Monday thru Friday, 8:30 a.m. to 7:00 p.m. and Saturday 11:00 a.m. to 4:00 p.m.

We have a staff of highly knowledgeable sales people waiting to hear from you, and to help.

Because service is what we're all about.

800-343-5504

In Mass. Call 617-491-2700

SYSTEMS
Customized

COMPUMART

65 BENT STREET, DEPT. 134, P.O. BOX 568 ✓43
CAMBRIDGE, MA 02139

SYM-1, 6502-BASED MICROCOMPUTER

- FULLY-ASSEMBLED AND COMPLETELY INTEGRATED SYSTEM that's ready-to-use
- ALL LSI IC'S ARE IN SOCKETS
- 28 DOUBLE-FUNCTION KEYPAD INCLUDING UP TO 24 "SPECIAL" FUNCTIONS
- EASY-TO-VIEW 6-DIGIT HEX LED DISPLAY
- KIM-1* HARDWARE COMPATIBILITY
The powerful 6502 8-Bit MICROPROCESSOR whose advanced architectural features have made it one of the largest selling "micros" on the market today.
- THREE ON-BOARD PROGRAMMABLE INTERVAL TIMERS available to the user, expandable to five on-board.
- 4K BYTE ROM RESIDENT MONITOR and Operating Programs.
- Single 5 Volt power supply is all that is required.
- 1K BYTES OF 2114 STATIC RAM onboard with sockets provided for immediate expansion to 4K bytes onboard, with total memory expansion to 65, 536 bytes.
- USER PROM/ROM: The system is equipped with 3 PROM/ROM expansion sockets for 2316/2332 ROMs or 2716 EPROMs
- ENHANCED SOFTWARE with simplified user interface
- STANDARD INTERFACES INCLUDE:
 - Audio Cassette Recorder Interface with Remote Control (Two modes: 135 Baud KIM-1* compatible, Hi-Speed 1500 Baud)
 - Full duplex 20mA Teletype Interface
 - System Expansion Bus Interface
 - TV Controller Board Interface
 - CRT Compatible Interface (RS-232)
- APPLICATION PORT: 15 Bi-directional TTL Lines for user applications with expansion capability for added lines
- EXPANSION PORT FOR ADD-ON MODULES (51 I/O Lines included in the basic system)
- SEPARATE POWER SUPPLY connector for easy disconnect of the d-c power
- AUDIBLE RESPONSE KEYPAD

QUALITY EXPANSION BOARDS DESIGNED SPECIFICALLY FOR KIM-1, SYM-1 & AIM 65

These boards are set up for use with a regulated power supply such as the one below, but, provisions have been made so that you can add onboard regulators for use with an unregulated power supply. But, because of unreliability, we do not recommend the use of onboard regulators. All I.C.'s are socketed for ease of maintenance. All boards carry full 90-day warranty.

All products that we manufacture are designed to meet or exceed industrial standards. All components are first quality and meet full manufacturer's specifications. All this and an extended burn-in is done to reduce the normal percentage of field failures by up to 75%. To you, this means the chance of inconvenience and lost time due to a failure is very rare; but, if it should happen, we guarantee a turn-around time of less than forty-eight hours for repair.

Our money back guarantee: If, for any reason you wish to return any board that you have purchased directly from us within ten (10) days after receipt, complete, in original condition, and in original shipping carton; we will give you a complete credit or refund less a \$10.00 restocking charge per board.

VAK-1 8-SLOT MOTHERBOARD

This motherboard uses the KIM-4* bus structure. It provides eight (8) expansion board sockets with rigid card cage. Separate jacks for audio cassette, TTY and power supply are provided. Fully buffered bus.

VAK-1 Motherboard \$139.00

VAK-2/4 16K STATIC RAM BOARD

This board using 2114 RAMs is configured in two (2) separately addressable 8K blocks with individual write-protect switches.

VAK-2 16K RAM Board with only 8K of RAM (1/2 populated) \$239.00

VAK-3 Complete set of chips to expand above board to 16K \$125.00

VAK-4 Fully populated 16K RAM \$325.00

VAK-5 2708 EPROM PROGRAMMER

This board requires a +5 VDC and ± 12 VDC, but has a DC to DC

multiplier so there is no need for an additional power supply. All software is resident in on-board ROM, and has a zero-insertion socket.

VAK-5 2708 EPROM Programmer \$249.00

VAK-6 EPROM BOARD

This board will hold 8K of 2708 or 2758, or 16K of 2716 or 2516 EPROMs. EPROMs not included.

VAK-6 EPROM Board \$119.00

VAK-7 COMPLETE FLOPPY-DISK SYSTEM

See May Kilobaud for details

\$1299.00

VAK-8 PROTOTYPING BOARD

This board allows you to create your own interfaces to plug into the motherboard. Etched circuitry is provided for regulators, address and data bus drivers; with a large area for either wire-wrapped or soldered IC circuitry.

VAK-8 Prototyping Board \$39.00

POWER SUPPLIES

ALL POWER SUPPLIES are totally enclosed with grounded enclosures for safety, AC power cord, and carry a full 2-year warranty.

FULL SYSTEM POWER SUPPLY

This power supply will handle a microcomputer and up to 65K of our VAK-4 RAM. ADDITIONAL FEATURES ARE: Over voltage Protection on 5 volts, fused, AC on/off switch. Equivalent to units selling for \$225.00 or more.

Provides +5 VDC @ 10 Amps & ± 12 VDC @ 1 Amp

VAK-EPS Power Supply \$119.00

VAK-EPS/AIM—same as VAK-EPS but w/additional 24 volt unregulated (specifically for AIM 65) **\$149.00**

KIM-1* Custom P.S. provides 5 VDC @ 1.2 Amps

and +12 VDC @ .1 Amps

KCP-1 Power Supply \$39.00

*KIM is a product of MOS Technology

Add \$2.50 for shipping & handling for all except AIM 65.

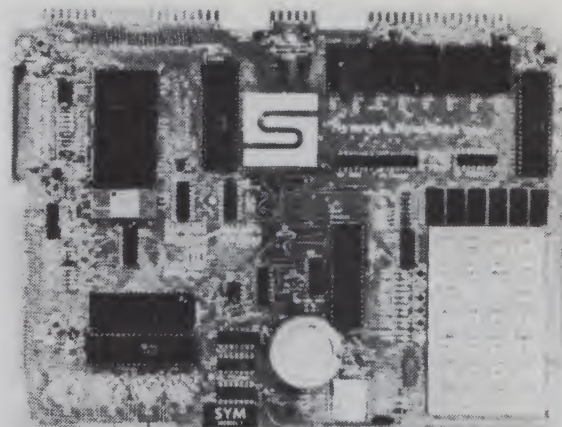
**WE'VE EXPANDED AGAIN!
NOTE OUR NEW ADDRESS.**

2951 W. Fairmount Avenue
Phoenix AZ 85017

(602)265-7564

RNB ENTERPRISES
INCORPORATED

52



Synertek has enhanced KIM-1* software as well as the hardware. The software has simplified the user interface. The basic SYM-1 system is programmed in machine language. Monitor status is easily accessible, and the monitor gives the keypad user the same full functional capability of the TTY user. The SYM-1 has everything the KIM-1* has to offer, plus so much more that we cannot begin to tell you here. So, if you want to know more, the SYM-1 User Manual is available, separately

SYM-1 Complete w/manuals \$229.00

SYM-1 User Manual Only \$7.00

SYM-1 Expansion \$60.00

Expansion includes 3K of 2114 RAM chips and 1-6522 I/O chip.

SYM-1 Manuals: The well organized documentation package is complete and easy-to-understand.

SYM-1 CAN GROW AS YOU GROW. It's the system to BUILD-ON.

Expansion features that are available:

BAS-18K Basic ROM (Microsoft Basic) \$89.00

KTM-2 (Complete terminal less monitor) \$319.00



WAMECO

THE COMPLETE PC BOARD HOUSE EVERYTHING FOR THE S-100 BUSS

- * **MEM-3** 24 ADDRESS LINES EXPANDABLE IN 1K INCR. ADDRESSABLE IN 8K BLOCKS. BIDIRECTIONAL BUSSING.

PCBD \$ 42.95 KIT LESS RAM \$119.95
KIT WITH Z114L-4 \$475.95 KIT WITH Z114L-2 \$549.95
A&T WITH Z114L-4 \$505.95 A&T WITH Z114L-2 \$579.95

- * **FPB-1A** FRONT PANEL BOARD FOR 8080A AND Z80 SYSTEMS IMSAI COMPATIBLE.

PCBD \$56.95 KIT \$175.00

- * **MEM-2** 16K RAM 2114's. ADDRESSABLE IN 4K BOUNDARIES.

PCBD \$33.95 KIT (LESS RAMS) \$80.95

- * **EPM-2** 16/32K ROM USES 2716 OR 2708. ADDRESSABLE IN 4K BOUNDARIES.

PCBD \$33.95 KIT (LESS ROMS) \$74.95

- * **CPU-1** 8080A PROCESSOR BOARD WITH VECTOR INTERRUPT.

PCBD \$33.95 KIT \$124.95

- * **QMB-12** 13 SLOT MOTHER BOARD.

PCBD \$42.95 KIT \$125.95

- * **QMB-9** 9 SLOT MOTHER BOARD.

PCBD \$35.95 KIT \$109.95

- * **PTB-1** POWER SUPPLY AND TERMINATOR BOARD.

PCBD \$29.95 KIT \$49.95

- * **RTC-1** REAL TIME CLOCK BOARD WITH TWO INTERRUPTS.

PCBD \$29.95 KIT \$79.95

- * **MEM-1A** 8K RAM, USES 2102's.

PCBD \$33.95 KIT (LESS RAM) \$71.95

- * **IOB-1** I/O BOARD. ONE SERIAL, TWO PARALLEL WITH CASSETTE.

PCBD \$33.95

- * **FDC-1A** FLOPPY DISC CONTROLLER BOARD USES 1771.

PCBD \$45.95

FUTURE PRODUCTS: 80 CHARACTER VIDEO BOARD.
Z-80 CPU BOARD WITH ROM, 8 PARALLEL PORT I/O BOARD.

DEALER INQUIRIES INVITED, UNIVERSITY DISCOUNTS AVAILABLE
AT YOUR LOCAL DEALER

WMC inc.

WAMECO, INC., P. O. BOX 877 • 455 PLAZA ALHAMBRA • EL GRANADA, CA 94018 • (415) 728-9114



CALIFORNIA COMPUTER SYSTEMS

32K RAM BOARD A&T.
450 NSEC \$579.95, 200 NSEC \$629.95
16K RAM A&T.
450 NSEC \$255.95, 200 NSEC \$285.95
64K DYNAMIC A&T.
200 NSEC \$579.95
Z80 PROCESSOR A&T. \$259.00
DISC CONTROLLER \$339.95
APPLE IEEE INSTRUMENTATION INTERFACE
KIT 7490. A & T \$275.00
ARITHMETIC PROCESSOR FOR APPLE 7811A.
A & T \$342.80
APPLE ASYNCHRONOUS SERIAL INTERFACE
7710A. A & T \$137.10
APPLE SYNCHRONOUS SERIAL INTERFACE
7712A. A & T \$153.95
ALL OTHER CCS PRODUCTS AVAILABLE



PB-1 2708 & 2716 Programming Board with provisions for 4K or 8K EPROM. No external supplies required. Textool sockets. Kit \$143.00
CB-1A 8080 Processor Board. 2K of PROM 256 BYTE RAM power on/rest Vector Jump Parallel port with status. Kit \$146.00 PCBD \$31.95
VB-3 80x24 VIDEO BOARD Graphics included 4MHZ. Kit \$379.95
IO-4 Two serial I/O ports with full handshaking 20/60 ma current loop. Two parallel I/O ports. Kit \$168.00 PCBD \$31.95
VB-IC 64 x 16 video board, upper lower case Greek composite and parallel video with software. S-100. Kit \$143.00
CB-2 Z80 CPU BOARD. Kit \$199.95
AIO APPLE SERIAL/PARALLEL Kit \$144.95
ALL OTHER SSM PRODUCTS AVAILABLE



WAMECO INC.

MEM-3 32K STATIC RAM 2114 24 bit addressing \$36.95
FDC-1 FLOPPY CONTROLLER BOARD will drive shugart, pertek, remic 5" & 8" drives up to 8 drives, on board PROM with power boot up, will operate with CPM™ (not included). PCBD \$43.95
FPB-1 Front Panel. IMSAI size, hex displays. Byte, or instruction single step. PCBD \$48.50
QM-12 MOTHER BOARD. 13 slot, terminated, S-100 board only \$39.95
CPU-1 8080A Processor board S-100 with 8 level vector interrupt. PCBD \$28.95
RTC-1 Realtime clock board. Two independent interrupts. Software programmable. PCBD \$25.95
EPM-2 2708/2716 16K/32K EPROM CARD. PCBD \$28.95
QM-9 MOTHER BOARD. Short Version of QM-12. 9 Slots. PCBD \$33.95
MEM-2 16K x 8 Fully Buffered 2114 Board. PCBD \$28.95
PTB-1 POWER SUPPLY AND TERMINATOR BOARD. PCBD \$28.95
IOB-1 SERIAL AND PARALLEL INTERFACE. 2 parallel. one serial and cassette. PCBD \$28.95
2708 \$7.50 2114L 450 NSEC \$4.99
2716 \$25.95 2114L 200 NSEC \$5.99

MIKOS

(415) 728-9121

P. O. Box 955 • El Granada, CA 94018

Please send for IC, Xistor and Computer parts list

MARCH SPECIAL SALE ON PREPAID ORDERS

(Charge cards not included on this offer)

A & T 8K x 8 RAM BOARD SALE

ON SSM, MB-6B, PCBD \$74.95
ON WAMECO MEM-1, PCBD \$74.95
450 NSECONDS ASSEMBLED AND TESTED.
PART MAY BE REMARKS. 2.5 AMPS TYPICAL.

WAMECO PCBD

IOB-1, CPU-1 \$24.95 EA.
PTB-1, RTC-1 \$22.95 EA.

MIKOS PARTS ASSORTMENT

WITH WAMECO AND CYBERCOM PCBDS

MEM-3 less RAM \$ 95.95
With 2114L-4 \$350.00
With 2114L-2 \$390.00
CPU-1 with MIKOS #2 8080A CPU \$99.95
QM-12 with MIKOS #4 13 slot mother board \$110.95
RTC-1 with MIKOS #5 real time clock \$65.95
EPM-2 with MIKOS #11 16-32K EPROMS less EPROMS \$65.95
QM-9 with MIKOS #12 9 slot mother board \$99.95
FPB-1 with MIKOS #14 all parts for front panel \$144.95

MIKOS PARTS ASSORTMENTS ARE ALL FACTORY MARKED PARTS. KITS INCLUDE ALL PARTS LISTED AS REQUIRED FOR THE COMPLETE KIT LESS PARTS LISTED. ALL SOCKETS INCLUDED

LARGE SELECTION OF LS TTL AVAILABLE
PURCHASE \$50.00 WORTH OF LS TTL AND GET 10% CREDIT TOWARD ADDITIONAL PURCHASES. PREPAID ORDERS ONLY.

VISA or MASTERCARD. Send account number, interbank number, expiration date and sign your order. Approx. postage will be added. Check or money order will be sent post paid in U.S. If you are not a regular customer, please use charge, cashier's check or postal money order. Otherwise there will be a two-week delay for checks to clear. Calif. residents add 6% tax. Money back 30-day guarantee. We cannot accept returned IC's that have been soldered to. Prices subject to change without notice. \$10 minimum order. \$1.50 service charge on orders less than \$10.00.

DIGITAL RESEARCH COMPUTERS

(214) 271-3538

32K S-100 EPROM CARD NEW!



\$74.95
KIT

USES 2716's
Blank PC Board - \$34
ASSEMBLED & TESTED
ADD \$30

SPECIAL: 2716 EPROM's (450 NS) Are \$11.95 EA. With Above Kit.

KIT FEATURES:

1. Uses +5V only 2716 (2Kx8) EPROM's.
2. Allows up to 32K of software on line!
3. IEEE S-100 Compatible.
4. Addressable as two independent 16K blocks.
5. Cromemco extended or Northstar bank select.
6. On board wait state circuitry if needed.
7. Any or all EPROM locations can be disabled.
8. Double sided PC board, solder-masked, silk-screened.
9. Gold plated contact fingers.
10. Unselected EPROM's automatically powered down for low power.
11. Fully buffered and bypassed.
12. Easy and quick to assemble.

32K SS-50 RAM

\$379⁰⁰ KIT

NEW!

For 2MHZ
Add \$10

Blank PC Board
\$50

For SWTPC
6800 - 6809 Buss

Support IC's
and Caps
\$19.95

Complete Socket Set
\$21.00

Fully Assembled,
Tested, Burned In
Add \$30

At Last! An affordable 32K Static RAM with full 6809 Capability.

FEATURES:

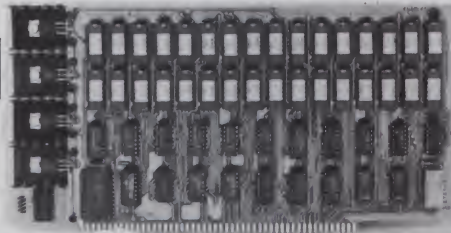
1. Uses proven low power 2114 Static RAMS.
2. Supports SS50C - EXTENDED ADDRESSING.
3. All parts and sockets included.
4. Dip Switch address select as a 32K block.
5. Extended addressing can be disabled.
6. Works with all existing 6800 SS50 systems.
7. Fully bypassed. PC Board is double sided, plated thru, with silk screen.

16K STATIC RAM KIT-S 100 BUSS

PRICE CUT!

\$199⁹⁵ KIT

FOR 4MHZ
ADD \$10



KIT FEATURES:

1. Addressable as four separate 4K Blocks.
2. ON BOARD BANK SELECT circuitry. (Cromemco Standard). Allows up to 512K on line!
3. Uses 2114 (450NS) 4K Static Rams.
4. ON BOARD SELECTABLE WAIT STATES.
5. Double sided PC Board, with solder mask and silk screened layout. Gold plated contact fingers.
6. All address and data lines fully buffered.
7. Kit includes ALL parts and sockets.
8. PHANTOM is jumpered to PIN 67.
9. LOW POWER: under 1.5 amps TYPICAL from the +8 Volt Buss
10. Blank PC Board can be populated as any multiple of 4K.

BLANK PC BOARD W/DATA-\$33
LOW PROFILE SOCKET SET-\$12
SUPPORT IC'S & CAPS-\$19.95
ASSEMBLED & TESTED-ADD \$35

**OUR #1 SELLING
RAM BOARD!**

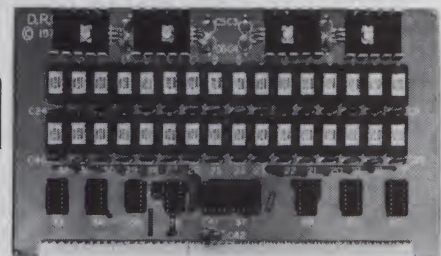
16K STATIC RAM SS-50 BUSS

PRICE CUT!

\$195 KIT

FULLY STATIC!

FOR 2MHZ
ADD \$10



FOR SWTPC
6800 BUSS!

ASSEMBLED AND
TESTED - \$35

KIT FEATURES:

1. Addressable on 16K Boundaries
2. Uses 2114 Static Ram
3. Fully Bypassed
4. Double sided PC Board. Solder mask and silk screened layout.
5. All Parts and Sockets included
6. Low Power: Under 1.5 Amps Typical

BLANK PC BOARD-\$35
COMPLETE SOCKET SET-\$12
SUPPORT IC'S AND CAPS-\$19.95

NEW! STEREO! S-100 SOUND COMPUTER BOARD NEW!

At last, an S-100 Board that unleashes the full power of two unbelievable General Instruments AY3-8910 NMOS computer sound IC's. Allows you under total computer control to generate an infinite number of special sound effects for games or any other program. Sounds can be called in BASIC, ASSEMBLY LANGUAGE, etc.

KIT FEATURES:

- * TWO GI SOUND COMPUTER IC'S.
- * FOUR PARALLEL I/O PORTS ON BOARD.
- * USES ON BOARD AUDIO AMPS OR YOUR STEREO.
- * ON BOARD PROTO TYPING AREA.
- * ALL SOCKETS, PARTS AND HARDWARE ARE INCLUDED.
- * PC BOARD IS SOLDERMASKED, SILK SCREENED, WITH GOLD CONTACTS.
- * EASY, QUICK, AND FUN TO BUILD. WITH FULL INSTRUCTIONS.
- * USES PROGRAMMED I/O FOR MAXIMUM SYSTEM FLEXIBILITY.

Both Basic and Assembly Language Programming examples are included.

SOFTWARE:

SCL™ is now available! Our Sound Command Language makes writing Sound Effects programs a SNAP! SCL™ also includes routines for Register-Examine-Modify, Memory-Examine-Modify, and Play-Memory. SCL™ is available on CP/M™ compatible diskette or 2708 or 2716. Diskette-\$24.95 2708 - \$19.95 2716 - \$29.95. Diskette includes the source. EPROM'S are ORG at E000H.

COMPLETE KIT!
\$84⁹⁵
(WITH DATA MANUAL)

BLANK PC
BOARD W/DATA
\$31

COMPUTER PARTS SPECIALS

74LS175 - .99	8035 Intel Single Chip CPU 6.95
74LS240 - 1.19	Signetics 2901 4 Bit Slice - 6.95
74LS241 - 1.19	AMD 2903 4 Bit Super Slice - 12.50
74LS244 - 1.19	AMD 29705 Dual Port RAM - 8.95
74LS373 - 1.29	Intel 2716-1 (350 NS) - 12.95

4K DYNAMIC RAM BLOWOUT! SAME AS INTEL 2107B!

4K RAMS AT AN UNBELIEVABLE 50¢ EACH!!!

Prime, new, National Semi., 1979 date coded, full spec. parts. N.S. #MM5280-5N. Same as INTEL 2107B-4, T.I. TMS4060, NEC uPD411, etc. We bought a HUGE QTY. from a West Coast Distributor at truly DISTRESS PRICES! One of the most popular and reliable RAM's ever made. These parts have been used by almost all Major Computer Main Frame Mfg. the world over! Arranged as 4K x 1, 270NS Access Time, 22 Pin Dip. These units DO NOT use multiplexed addressing, thus making REFRESH and other timing very simple. See INTEL MEMORY DESIGN HANDBOOK for full application notes. The NAT. SEMI. MEMORY DATA BOOK is available at most Radio Shack Stores. Prime units in original factory tubes!

(With Pin
Out Data)

#5280-5N 4096 BITS x 1 270 NS ACCESS

8 FOR \$4.95 32 FOR \$16

FACTORY CASE (450 PCS) — \$180

Sockets Special: 22 Pin Low Profile (With Purchase of 5280's) 8 FOR \$1.

NEW! G.I. COMPUTER SOUND CHIP

AY3-8910. As featured in July, 1979 BYTE! A fantastically powerful Sound & Music Generator. Perfect for use with any 8 Bit Microprocessor. Contains: 3 Tone Channels, Noise Generator, 3 Channels of Amplitude Control. 16 bit Envelope Period Control, 2-8 Bit Parallel I/O. 3 D to A Converters, plus much more! All in one 40 Pin DIP. Super easy interface to the S-100 or other busses. **\$11.95 PRICE CUT!**

SPECIAL OFFER: \$14.95 each Add \$3 for 60 page Data Manual.

TERMS: Add \$1.50 postage. We pay balance. Orders under \$15 add 75¢ handling. No C.O.D. We accept Visa and MasterCard. Tex. Res. add 5% Tax. Foreign orders (except Canada) add 20% P & H. Orders over \$50, add 85¢ for insurance.

Digital Research Computers (OF TEXAS)

P.O. BOX 401565 • GARLAND, TEXAS 75040 • (214) 271-3538

ALL SALES ARE MADE SUBJECT TO THE TERMS OF OUR 90 DAY LIMITED WARRANTY. A COPY OF THIS WARRANTY IS AVAILABLE FREE, ON REQUEST.

*TRADEMARK OF DIGITAL RESEARCH.

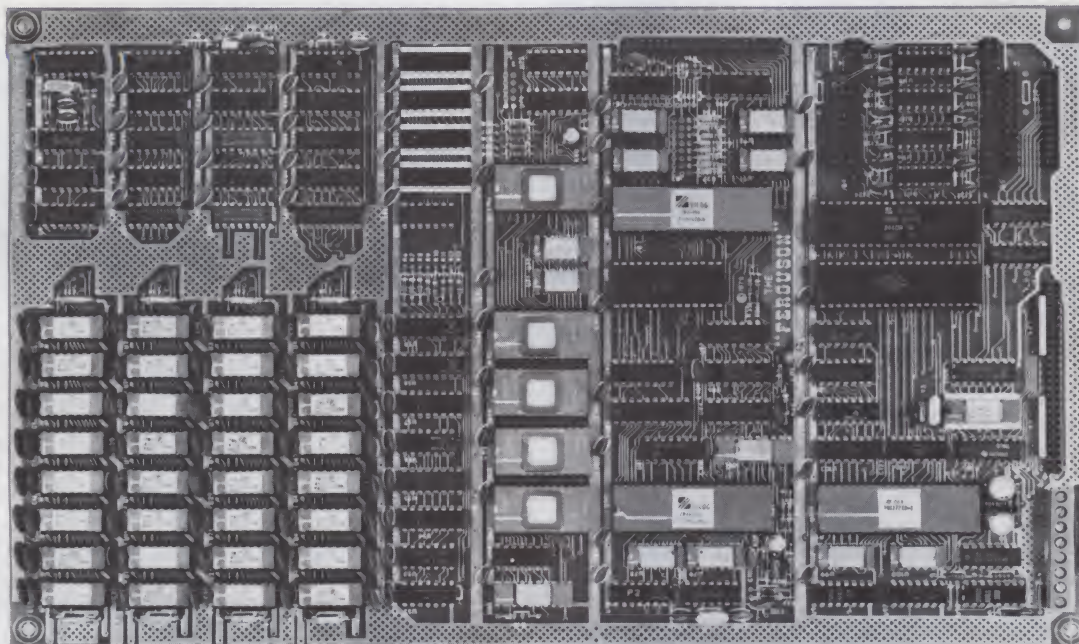
WE ARE NOT ASSOCIATED WITH DIGITAL RESEARCH OF CALIFORNIA, THE SUPPLIERS OF CPM SOFTWARE.

NEW!

"THE BIG BOARD" OEM - INDUSTRIAL - BUSINESS - SCIENTIFIC SINGLE BOARD COMPUTER KIT! Z-80 CPU! 64K RAM!

NEW!

PARTIAL KIT
For All Sockets Installed
And Soldered Add \$50.



THE FERGUSON PROJECT: Three years in the works, and maybe too good to be true. A tribute to hard headed, no compromise, high performance, American engineering! The Big Board gives you all the most needed computing features on one board at a very reasonable cost. The Big Board was designed from scratch to run the latest version of CP/M*. Just imagine all the off-the-shelf software that can be run on the Big Board without any modifications needed! Take a Big Board, add a couple of 8 inch disc drives, power supply, an enclosure, C.R.T., and you have a total Business System for about 1/3 the cost you might expect to pay.

\$649⁰⁰ (64K KIT
BASIC I/O)

SIZE: 8 1/2 x 13 1/4 IN.
SAME AS AN 8 IN. DRIVE.
REQUIRES: +5V @ .3 AMPS
+ - 12V @ .5 AMPS.

FULLY SOCKETED!

FEATURES: (Remember, all this on one board!)

64K RAM

Uses industry standard 4116 RAM'S. All 64K is available to the user, our VIDEO and EPROM sections do not make holes in system RAM. Also, very special care was taken in the RAM array PC layout to eliminate potential noise and glitches.

Z-80 CPU

Running at 2.5 MHZ. Handles all 4116 RAM refresh and supports Mode 2 INTERRUPTS. Fully buffered and runs 8080 software.

SERIAL I/O (OPTIONAL)

Full 2 channels using the Z80 SIO and the SMC 8116 Baud Rate Generator. FULL RS232! For synchronous or asynchronous communication. In synchronous mode, the clocks can be transmitted or received by a modem. Both channels can be set up for either data-communication or data-terminals. Supports mode 2 Int. Price for all parts and connectors: \$85.

BASIC I/O

Consists of a separate parallel port (Z80 PIO) for use with an ASCII encoded keyboard for input. Output would be on the 80 x 24 Video Display.

SYSTEM COMPARISON

64K RAM KIT	\$370.00
80 x 24 Video Kit	365.00
Floppy Disk Controller Kit	235.00
Z-80 CPU Kit	185.95
SER & PAR. I/O	129.95
S-100 Mother Board	45.00
SUB TOTAL	\$1330.90

Talk about bangs per buck! The prices shown for \$100 kits were taken from the July 1980 BYTE. This will give some basis for comparison between the Big Board and a similar system implementation on the S100 Buss.

24 x 80 CHARACTER VIDEO

With a crisp, flicker-free display that looks extremely sharp even on small monitors. Hardware scroll and full cursor control. Composite video or split video and sync. Character set is supplied on a 2716 style ROM, making customized fonts easy. Sync pulses can be any desired length or polarity. Video may be inverted or true. 5 x 7 Matrix - Upper & Lower Case

FLOPPY DISC CONTROLLER

Uses WD1771 controller chip with a TTL Data Separator for enhanced reliability. IBM 3740 compatible. Supports up to four 8 inch disc drives. Directly compatible with standard Shugart drives such as the SA800 or SA801. Drives can be configured for remote AC off-on. Runs CP/M* 2.2.

TWO PORT PARALLEL I/O (OPTIONAL)

Uses Z-80 PIO. Full 16 bits, fully buffered, bi-directional. User selectable hand shake polarity. Set of all parts and connectors for parallel I/O: \$29.95

REAL TIME CLOCK (OPTIONAL)

Uses Z-80 CTC. Can be configured as a Counter on Real Time Clock. Set of all parts: \$14.95

CP/M* 2.2 FOR BIG BOARD

The popular CP/M* D.O.S. modified by MICRONIX SYSTEMS to run on Big Board is available for \$150.00.

PC BOARD

Blank PC Board with Rom Set and Full Documentation.
\$195.00

PFM 3.0 2K SYSTEM MONITOR

The real power of the Big Board lies in its PFM 3.0 on board monitor. PFM commands include: Dump Memory, Boot CP/M*, Copy, Examine, Fill Memory, Test Memory, Go To, Read and Write I/O Ports, Disc Read (Drive, Track, Sector), and Search. PFM occupies one of the four 2716 EPROM locations provided.
Z-80 is a Trademark of Zilog.

Digital Research Computers

(OF TEXAS)

P.O. BOX 401565 • GARLAND, TEXAS 75040 • (214) 271-3538

TERMS: Initial shipments will be made approximately 3 to 5 weeks after we receive your order. VISA, MC, cash accepted. We will accept COD's (for the Big Board only) with a \$75 deposit. Balance UPS COD. The \$75 deposit assures your place in line for the initial production run of Big Board.

*TRADEMARK OF DIGITAL RESEARCH. NOT ASSOCIATED WITH DIGITAL RESEARCH OF CALIFORNIA, THE ORIGINATORS OF CPM SOFTWARE
**1 TO 4 PIECE DOMESTIC USA PRICE.

SALE SALE SALE

Disk Drives



JADE's new dual disk sub-assemblies include: Handsome metal cabinet with proportionally balanced air flow system, rugged dual drive power supply, cooling fan, cable kit, lighted power switch, approved fuse assembly, line cord, Never-Mar rubber feet, and all necessary hardware to mount 2-8" disk drives - it's all American made, guaranteed for six months, and it's in stock!

Dual 8" Sub-Assembly Cabinet

END-000421 Cabinet kit \$225.00
END-000420 Bare cabinet \$59.95

Single sided, double density disk drive sub-system

END-000423 Kit w/2 8" drives \$975.00
END-000424 A & T w/2 8" drives \$1195.00

Double sided, double density disk drive sub-system

END-000426 kit w/2 8" drives \$1495.00
END-000427 A & T w/2 8" drives \$1695.00

JADE DISK PACKAGE

Double density controller, two 8" double density floppy disk drives, CP/M 2.2 (configured for controller), hardware and software manuals, boot PROM, cabinet, power supply, fan, & cables

Special package price \$1395.00

8" Disk Drive Sale

Highly reliable double density floppy disk drives

Shugart 801R single sided, double density

MSF-10801R SA-801R \$425.00
Special Sale Price 2 for \$790.00

Siemens FDD100-8D2 single sided, double density

MSF-201120 6 mo warranty \$385.00
Special sale price 2 for \$750.00

Real Double-Sided Drives 8" Double-Sided Double-Density Sale

* Shugart SA-851R double-sided, double-density *

* only \$625.00 ea 2 for \$1190.00 *

MFE M701 8" double-sided, double-density drives

only \$525 ea 2 for \$1040.00

Qume Data Track 8 double-sided, double-density drives

only \$575.00 2 for \$1100.00

Printers

CENTRONICS 737-1

9 x N dot matrix, letter quality, proportional spacing

PRM-15737 Parallel \$795.00

With interface for Apple \$895.00

MX-80 - Epson

132 column, 9 x 9 dot matrix, multiple fonts

PRM-27080 Save \$100.00 \$545.00

Interface for Apple \$110.00



SPINWRITER - NEC

65 cps, bi-directional, letter quality printer with deluxe tractor mechanism, both parallel and serial interfaces on-board, 16K buffer, ribbon, print thimble, graphics, micro space justification, data cable, and self test diagnostic ROM.

PRD-55511 without 16K buffer \$2795.00

PRD-55512 with 16K buffer \$2895.00

S-100 Systems

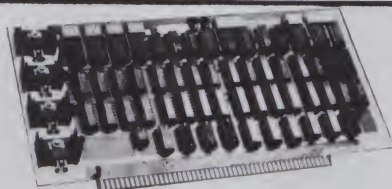
S-100 SYSTEM - Calif Computer Sys

Complete S-100 system including 12 slot mainframe, 4 MHz Z-80 CPU, 64K RAM memory, double density disk controller, RS-232 cable, 8" & 5 1/4" disk drive cables, CP/M 2.2, manuals, auto boot ROM, completely assembled & tested.

2210A Integrated & tested \$1995.00

2210B Not integrated \$1795.00

S-100 Memory



64K RAM - Calif Computer Sys

4 MHz bank port & bank byte selectable, extended addressing, 16K bank selectable, PHANTOM line allows memory overlay, 8080 & Z-80 front panel compatible.

MEM-64565A A & T \$449.95

MEMORY BANK - Jade

4 MHz, IEEE S-100, bank selectable, 8 or 16 bit

MEM-99730B Bare board \$55.00

MEM-99730K Kit, no RAM \$219.95

MEM-16730K 16K kit \$249.95

MEM-32731K 32K kit \$289.95

MEM-48732K 48K kit \$324.95

MEM-64733K 64K kit \$359.95

Assembled & tested add \$50.00

EXPANDORAM II - S D Systems

1 MHz RAM board expandable from 16K to 256K

MEM-16630K 16K kit \$275.95

MEM-32631K 32K kit \$295.95

MEM-48632K 48K kit \$315.95

MEM-64633K 64K kit \$335.95

Assembled & tested add \$50.00

32K STATIC RAM - Jade

2 or 4 MHz expandable static RAM board uses 2111L's

MEM-16151K 16K 4 MHz kit \$169.95

MEM-32151K 32K 4 MHz kit \$299.95

Assembled & tested add \$50.00

16K STATIC RAM - Cal Comp Sys

2 or 4 MHz 16K static RAM board, IEEE S-100, bank selectable, Phantom capability, addressable in 4K blocks

MEM-16160A 16K 2 MHz A & T ... \$286.95

MEM-16162A 16K 4 MHz A & T ... \$289.95

MEM-16160B Bare board \$50.00

PB-1 - S.S.M.

2708, 2716 EPROM board with built-in programmer

MEM-99510K Kit \$154.95

MEM-99510A A & T \$229.95

PROM-100 - SD Systems

2708, 2716, 2732, 2758, & 2516 EPROM programmer

MEM-99520K Kit \$219.95

MEM-99520A Jade A & T \$269.95

S-100 Video

VB-3 - S.S.M.

80 characters x 24 lines expandable to 80 x 48 for a full page of text, upper & lower case, 256 user defined symbols, 160 x 192 graphics matrix, memory mapped, has key board input.

IOV-1095K 4 MHz kit \$375.00

IOV-1095A 4 MHz A & T \$450.00

IOV-1096K 80 x 48 upgrade \$39.95

VIDEO BOARD - Jade

64 characters x 16 lines, 7 x 9 dot matrix, full upper/lower case ASCII character set, numbers, symbols, and greek letters, normal/reverse blinking video, S-100.

IOV-1050K Kit \$99.95

IOV-1050A A & T \$125.00

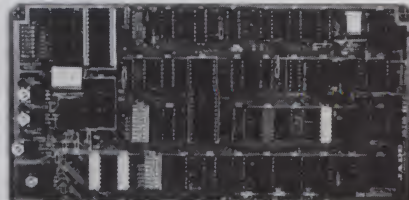
IOV-1050B Bare board \$19.95

S-100 CPU

2810 Z-80* CPU - Cal Comp Sys

2-4 MHz Z-80A* CPU with RS-232C serial I/O port and on-board MOSS 2.2 monitor PROM, front panel compatible.

CPU-30400A A & T \$269.95



THE BIG Z* - Jade

2 or 4 MHz switchable Z-80* CPU with serial I/O, accommodates 2708, 2716, or 2732 EPROM, baud rates from 75 to 9600

CPU-30201K Kit \$145.00

CPU-30201A A & T \$199.00

CPU-30200B Bare board \$35.00

CB-2 Z-80 CPU - S.S.M.

2 or 4 MHz Z-80 CPU board with provision for up to 8K of ROM or 4K of RAM on board, extended addressing, IEEE S-100, front panel compatible.

CPU-30300A A & T \$229.95

SBC-200 - SD Systems

4 MHz Z-80* CPU with serial & parallel I/O ports, up to 8K of on-board PROM, software programmable baud rate generator, 1K of on-board RAM, Z-80 CTC.

CPC-30200K Kit \$339.95

CPC-30200A Jade A & T \$399.95

S-100 Disk Controller

DOUBLE DENSITY - Cal Comp Sys

5 1/4" and 8" disk controller, single or double density, with on-board boot loader ROM, and free CP/M 2.2* and manual set.

IOD-1300A A & T \$369.95

DOUBLE-D - Jade

Double density controller with the inside track, on-board Z-80A*, printer port, IEEE S-100, can function on an interrupt driven buss

IOD-1200K Kit \$299.95

IOD-1200A 8" A & T \$389.95

IOD-1205A 5 1/4" A & T \$389.95

IOD-1200B Bare board \$65.00

VERSAFLOPPY II - SD Systems

New double density controller for both 8" & 5 1/4"

IOD-1160K Kit \$379.95

IOD-1160A Jade A & T \$439.95

Motherboards

ISO-BUS - Jade

Silent, simple, and on sale - a better motherboard

6 Slot (5 1/2" x 8 1/2")

MBS-061B Bare board \$19.95

MBS-061K Kit \$39.95

MBS-061A A & T \$49.95

12 Slot (9 1/2" x 8 1/2")

MBS-121B Bare board \$29.95

MBS-121K Kit \$69.95

MBS-121A A & T \$89.95

18 Slot (14 1/2" x 8 1/2")

MBS-181B Bare board \$49.95

MBS-181K Kit \$99.95

MBS-181A A & T \$139.95

Card Cages

S-100 CARD CAGE - Jade

Metal cage with card guides & fan mounting

ENX-106001 Six slot \$29.95

S-100 CARD CAGE - Vector

19" rack mountable, adjustable, holds 21 cards

VCT-CKK100 Anodized Al \$49.95

SALE SALE SALE

S-100 I/O

S.P.I.C. - Jade

Our new I/O card with 2 SIO's, 4 CTC's, and 1 PIO

IOI-1045K	2 CTC's, 1 SIO, 1 PIO	\$199.00
IOI-1045A	A & T	\$259.00
IOI-1046K	4 CTC's, 2 SIO's, 1 PIO	\$259.00
IOI-1046A	A & T	\$319.00
IOI-1045B	Bare board w/ manual	\$59.95
IOI-1045D	Manual only	\$20.00

I/O-4 - S.S.M.

2 serial I/O ports plus 2 parallel I/O ports

IOI-1010K	Kit	\$179.95
IOI-1010A	A & T	\$249.95
IOI-1010B	Bare board	\$35.00

TERMINATOR - S.S.M.

Active terminator for S-100 bus

TSX-195K	Kit	\$29.95
TSX-195A	A & T	\$54.95
TSX-195B	Bare board	\$22.95

S-100 EXTENDER - Cal Comp Sys

Put those problem boards (the ones you probably bought from one of our competitors) within easy reach.

TSX-160A	A & T	\$37.95
----------	-------	---------

S-100 PROTO BOARD - Jade

Universal design, plated thru holes, gold fingers

TSX-140B	Bare board	\$24.95
----------	------------	---------

TERMINATOR & EXTENDER - C.C.S.

Can be used as both an S-100 extender and terminator

TSX-150K	Kit	\$43.95
----------	-----	---------

Diskettes

DISKETTES - Jade

Bargain prices on magnificent magnetic media

5 1/4" single sided, single density, box of 10

MMD-5110103	Soft sector	\$27.95
MMD-5111003	10 sector	\$27.95
MMD-5111603	16 sector	\$27.95

5 1/4" double sided, double density, box of 10

MMD-5220103	Soft sector	\$39.95
-------------	-------------	---------

8" single sided, single density, box of 10

MMD-8110103	Soft sector	\$33.95
-------------	-------------	---------

8" single sided, double density, box of 10

MMD-8120103	Soft sector	\$39.95
-------------	-------------	---------

8" double sided, double density, box of 10

MMD-8220103	Soft sector	\$49.95
-------------	-------------	---------

Video Monitors

9" B & W MONITOR - A.P.F.

High quality, high resolution video monitor

VDM-750900	9" monitor	\$159.95
------------	------------	----------

13" COLOR MONITOR - Zenith

The hi res color you've been promising yourself

VDC-201301		\$449.00
------------	--	----------

12" GREEN SCREEN - NEC

20 MHz, P31 phosphor video monitor with audio, exceptionally high resolution - A fantastic monitor at a very reasonable price

VDM-651200	12" monitor	\$259.95
------------	-------------	----------

Mainframes

MAINFRAME - Cal Comp Sys

12 slot S-100 mainframe with 20 amp power supply

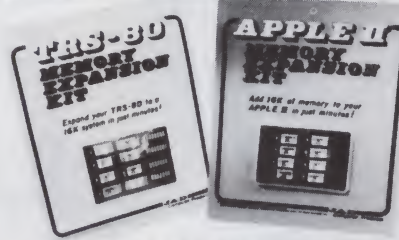
ENC-112105	Kit	\$359.95
ENC-112106	A & T	\$419.95

DISK MAINFRAME - NNC

Holds 2 8" drives and an 8 slot S-100 system. Attractive metal cabinet with 8 slot motherboard, power supply, fan, key switch, and other professional features

ENS-112320	with 30 amp p.s.	\$699.95
------------	------------------	----------

Accessories-Apple/TRS-80



16K MEMORY UPGRADE

Add 16K of RAM to your TRS-80, Apple, or Exidy in just minutes. We've sold thousands of these 16K RAM upgrades which include the appropriate memory chips (as specified by the manufacturer), all necessary jumper blocks, fool-proof instructions, and our 1 year guarantee.

MEX-16100K	TRS-80 kit	\$29.00
MEX-16101K	Apple kit	\$29.00
MEX-16102K	Exidy kit	\$29.00

DISK DRIVE for APPLE

5 1/4" disk drive with controller for your Apple

MSM-12310C	with controller	\$499.95
MSM-123101	w/out controller	\$375.00

DISK DRIVES for TRS-80

23% more storage, 8 times faster, 40 track with free patch, 120 day warranty, includes case, power supply, and cable

MSM-12410C	Save \$125.00 !!!	\$299.95
------------	-------------------	----------

DOS 3.3 UPGRADE - Apple

Upgrade your old DOS to the improved 3.3

IOD-2233A	Complete kit	\$64.95
-----------	--------------	---------

APPLE STICK - Micromate

Joy stick with pots for Apple II

SYA-1510A	A & T	\$35.95
-----------	-------	---------

Z-80* CARD for APPLE

Z-80* CPU card with CP/M 2.2 for your Apple

CPX-30800A	A & T	\$279.95
------------	-------	----------

AIO - S.S.M.

Parallel & serial interface for your Apple

IOI-2050K	Kit	\$155.95
IOI-2050A	A & T	\$194.95

PRINTER INTERFACE - C.C.S.

Centronics type I/O card w/ firmware

IOI-2041A	A & T	\$99.95
-----------	-------	---------

APPLE CLOCK - Cal Comp Sys

Real time clock w/ battery back-up

IOK-2100A	A & T	\$109.95
-----------	-------	----------

Modems

LEX-11 MODEM - Lexicon

A real star! 300 baud, answer/originate, RS 232C

IOM-5511A	Best buy !!!	\$128.00
-----------	--------------	----------

NOVATION CAT

300 baud, answer, originate acoustic modem

IOM-5200A	1 year warranty	\$179.00
-----------	-----------------	----------

D-CAT 300 baud, direct connect modem

IOM-5201A	Special sale price	\$189.00
-----------	--------------------	----------

AUTO-CAT Auto answer/originate, direct connect

IOM-5230A	Special sale price	\$239.95
-----------	--------------------	----------

MICROMODEM - D.C. Hayes

Auto answer, dial modem card for Apple or S-100

IOM-2010A	Apple modem	\$349.95
IOM-1100A	S-100 modem	\$375.00

MICRONET MODEM - Micromate

Direct connect with extra features - a best buy

IOM-2020A	Best Apple modem	\$275.00
-----------	------------------	----------

* Z-80, Z-80A, and the letter Z are recognized trademarks of Zilog, Inc. *CP/M is a registered trademark of Digital Research Corp. *CBASIC is a trademark of Compiler Systems, Inc.

Single Board Computers



AIM-65 - Rockwell

6502 computer with alphanumeric display, printer, & keyboard, and complete instructional manuals

CPK-50165	1K AIM	\$374.95
CPK-50465	4K AIM	\$449.95
SFK-74600008E	8K BASIC ROM	\$99.95
SFK-64600004E	4K assembler ROM	\$84.95
PSX-030A	Power supply	\$64.95
ENX-000002	Enclosure	\$49.95

4K AIM, 8K BASIC, power supply, & enclosure

Special package price \$625.00

Z-80* STARTER KIT - SD Systems

Complete Z-80* computer with RAM, ROM, I/O, display, keyboard, manual, and kluge area.

CPS-30010K	Kit	\$369.95
CPS-30010A	Jade A & T	\$459.95

MICROPROCESSORS

Z-80	10.95
Z-80A	12.95
6502	11.50
6800	11.95
6802	17.95
6809	39.95
8035	24.00
8080A	6.50
8085	15.95
8748	59.95

PROMS

2708	450ns	6.25
10 for \$4.90 ea		
2716	125ns	11.95
2716	5ns	11.95
10 for \$8.90 ea		
2532	5ns	39.95
2732	5ns	39.95
2758	5ns	9.95

RAMS

21102	2 MHz	1.25
21102A	4 MHz	1.50
2114L	2 MHz	3.75
2114LA	4 MHz	3.95
4116		4.25
4164	60K x1	59.95
5257	2 MHz	6.75
5257A	4 MHz	7.25
MK4118		18.95

BAUD RATE GENERATORS

MC14411	10.00
1.843 MHz xtal	4.95

UARTS

AY5-1013A	5.25
AY3-1014A	8.25
TR1602B	5.25
TMS6011	5.95
IM6402	9.00

6800

6821P	5.95
6828P	11.95
6834P	22.50
6840P	18.75
6850P	4.80
6852P	5.79
6875L	7.40
68488P	25.00

SUPPORT

SUPPORT DEVICES

8212	3.25
8214	4.65
8216	2.95
8224	3.25
8224-4	5.75
8226	3.85
8228	4.95
8238	4.95
8243	8.00
8250	14.95
8251	6.50
8253	17.95
8255	6.50
8257	19.95
8259	17.95
8275	49.95
8279	15.95

PLACE ORDERS TOLL FREE

Continental U.S. Inside California
800-421-5500 800-262-1710

For Technical Inquiries or Customer Service call

✓ 48 213-973-7707

JADE
Computer Products

4901 W. Rosecrans, Hawthorne, Ca 90250

TERMS OF SALE: Cash, checks, credit cards, or Purchase Orders from qualified firms and institutions. Minimum order \$15.00. California residents add 6% tax. Minimum shipping and handling charge \$3.00 Pricing and availability subject to change without notice.

apple II plus apple II

With 48K of memory! \$1199

With 64K of memory! \$1389



APPLE INTERFACE CARDS

CENTRONICS PRINTER	199
COMMUNICATIONS W/serial cable	99
DISK II CONTROLLER d.p. & 1.3	149
INTERTON BASIC PARTNUMBER	195
APPLESOFT PARTNUMBER	195
PARSON LANGUAGE PACKAGE	499
PARALLEL PRINTER	175
PROTOTYPING/HOBBI	99
SERIAL PACKAGE	199

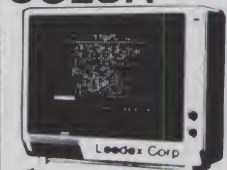
S-100

16K STATIC MEMORY BD.	209
32K STATIC MEMORY BD.	499
64K DYNAMIC MEMORY BD.	333
ADAPTER BOARD 12 SLOT	109
1.80 CPU BD.	389
MAINFRAME R.E. & MOD.	379
BIOS CONTROLLER BD.	363

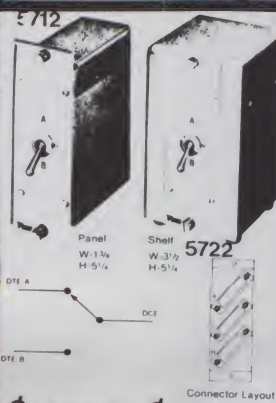
E PROMS

2708 1k x 8	5.95
8 FOR 40.00	
2716 2k x 8	9.95
single p.s.	8 FOR 80.00
2732 4k x 8	24.95
2716 2k x 8	6.95
triple p.s.	

COLOR



\$397.00 MONITOR 13"



\$14500 \$15500

Description
The RS-232C Compatible Digital Transfer Switch is designed to switch modems between front end processors. All 24 pins of the connector are switched, with Pin 1 wired to ground.

Tbar INCORPORATED

MODEL 800B IMPACT PRINTER

- Dot resolution graphics in six densities
- 1800 character buffer
- Fully adjustable tractor to 9-17

\$649.00
base inc. 2

MISCELLANEOUS

8038C	2.65
NE555V	27
7905	
7908	
7915	
7918	85
7805	
7806	
7808	
7812	
MC1330AIP	1.60
MC1350P	1.15
MC1358P	1.50
LM380N	1.75
NE565N	1.25
MC1458P	50
IS410 SCR	95
IT410 TRIAC	95
2114 200ns	3.50
2114L 300ns	3.75
2114L 200ns	4.25
4116 300ns	4.95
4116 200ns	5.45

S-100 MEMORY BOARD

16K STATIC RAM \$249.00
ASSEMBLED & TESTED
California Computer Systems

FULLY STATIC LINE RATION
4K BANK ADDRESSABLE
EXTENDED MEMORY MGMT
MEETS IEEE PROMISED
5 100 SIGNAL STANDARDS
4 MHz OPERATION

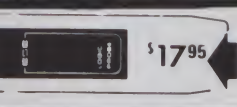
S-100 16K ADD-ON BARE BOARD

\$28.95
APPLE EXPANSION KIT 16K Memory Add-On \$39.00
INCLUDES INSTRUCTIONS



No "Glitches", Surges Or Interference

The MPD 117 is the low-cost solution to your power distribution problems. The MPD 117 has a high performance EMI filter, built-in circuit breaker, two direct and six switched outlets, illuminated on-off switch for switched outlets, and is built with rugged UL approved components and housing in an all steel chassis with convenient mounting flanges.



\$17.95 LOGIC PROBE KIT

WE CARRY Tbar SWITCHES

CONCORD COMPUTER COMPONENTS

1971 SOUTH STATE COLLEGE ANAHEIM, CALIF. 92806

VISA MASTERCARD CHECK OR M.O. NO C.O.D. CAL RES ADD 6% (714)937-0637

MINIMUM ORDER \$10.00 ADD \$1.50 FOR FRT. ON ORDERS UNDER \$50. 5% IF OVER \$50.

video 100



\$125
12" BLACK & WHITE LOW COST VIDEO MONITOR



\$124.95
apple clock/calendar

- Seconds, minutes, hours, day-of-week, month, date, a year.
- On board batteries with one year life.
- Uses MSM5832-crystal controlled.

California Computer Systems

HEATHKIT®

COMPUTER OWNERS WE HAVE H47 COMPATIBLE DISK OPERATING SYSTEM 8" Dual Sided, Double Density Intelligent MASTER/SLAVE

BY REMEX FULLY ASSEMBLED AND TESTED!

\$2450.00

SN7400N	.20	SN7482N	1.05
SN7402N	.22	SN7492N	.50
SN7404N	.22	SN7493N	.48
SN7408N	.24	SN7495N	.60
SN7410N	.22	SN7496N	.70
SN7412N	.28	SN74122N	.39
SN7413N	.35	SN74136N	.95
SN7414N	.49	SN74141N	.69
SN7416N	.29	SN74151N	.65
SN7417N	.29	SN74153N	.65
SN7423N	.28	SN74154N	1.25
SN7425N	.25	SN74155N	.80
SN7430N	.23	SN74157N	.69
SN7437N	.29	SN74160N	.95
SN7438N	.24	SN74161N	.65
SN7440N	.22	SN74163N	.85
SN7442N	.57	SN74164N	.87
SN7443N	.78	SN74165N	.87
SN7445N	.78	SN74174N	.95
SN7451N	.20	SN74175N	.69
SN7454N	.20	SN74180N	.75
SN7474N	.32	SN74181N	1.15
SN7475N	.32	SN74393N	1.69

TRS 80 16K Memory Add-On \$4395

KIT CONTAINS DIP SWITCHES AND DETAILED INSTRUCTIONS

74LS00	.26
74LS02	.26
74LS03	.26
74LS04	.26
74LS08	.28
74LS09	.26
74LS10	.26
74LS20	.26
74LS21	.26
74LS22	.26
74LS26	.49
74LS30	.28
74LS32	.32
74LS38	.32
74LS42	.65
74LS48	.78
74LS51	.25
74LS54	.35
74LS74	.38
74LS75	.60
74LS83	.44
74LS85	.95
74LS86	.95
74LS90	.69
74LS93	.69
74LS107	.45
74LS112	.38
74LS113	.48
74LS122	.48
74LS123	.95
74LS126	.69
74LS138	.69
74LS151	.44
74LS153	.44
74LS155	1.15
74LS158	.75
74LS160	.95
74LS161	.85
74LS162	.95
74LS163	1.60
74LS164	.65
74LS165	.65
74LS170	1.75
74LS174	.75
74LS175	.75
74LS180	.75
74LS193	.95
74LS195	.95
74LS196	.85
74LS221	1.40
74LS240	1.65
74LS241	1.65
74LS243	1.45
74LS244	1.45
74LS245	2.25
74LS253	.95
74LS257	.95
74LS258	.95
74LS259	2.65
74LS279	.44
74LS283	1.00
74LS293	1.85
74LS298	1.20
74LS366	.95
74LS367	.55
74LS368	.55
74LS373	1.39
74LS374	1.39

ATARI® 800™ PERSONAL COMPUTER SYSTEM



ATARI 800 COMPUTER \$819
ATARI 400 COMPUTER \$439
80 Col. Impact Printer \$775
40 Col. Thermal Printer \$379
Program Recorder \$65

SOROC TECHNOLOGY, INC.



IQ120 \$689

Global Specialties

Logic Probes



LP1 \$3749



LP2 \$2149



LP3 \$5849

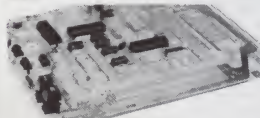
Start learning and computing for only \$129.95 with a Netronics 8085-based computer kit. Then expand it in low-cost steps to a business/development system with 64k or more RAM, 8" floppy disk drives, hard disks and multi-terminal I/O.

THE NEW EXPLORER/85 SYSTEM

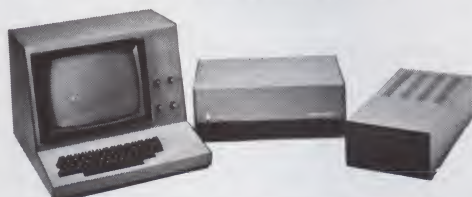
Special! Full 8" floppy, 64k system for less than the price of a mini! Only \$1499.95!

(Also available wired & tested, \$1799.95)

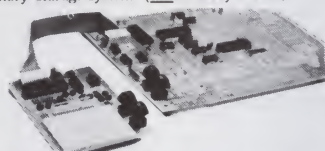
Imagine — for only \$129.95 you can own the starting level of Explorer/85, a computer that's expandable into full business/development capabilities — a computer that can be your beginner system, an OEM controller, or an IBM-formatted 8" disk small business system. From the first day you own Explorer/85, you begin computing on a significant level, and applying principles discussed in leading computer magazines. Explorer/85 features the advanced Intel 8085 CPU, which is 100% compatible with the older 8080A. It offers on-board S-100 bus expansion, Microsoft BASIC in ROM, plus instant conversion to mass storage disk memory with standard IBM-formatted 8" disks. All for only \$129.95, plus the cost of power supply, keyboard/terminal and RF modulator if you don't have them (see our remarkable prices below for these and other accessories). With a Hex Keypad/display front panel, Level "A" can be programmed with no need for a terminal, ideal for a controller, OEM, or a real low-cost start.



Level "A" is a complete operating system, perfect for beginners, hobbyists, industrial controller use. \$129.95



Full 8" disk system for less than the price of a mini (shown with Netronics Explorer/85 computer and new terminal). System features floppy drive from Control Data Corp., world's largest maker of memory storage systems (not a hobby brand!)



Level "A" With Hex Keypad/Display.

LEVEL "A" SPECIFICATIONS

Explorer/85's Level "A" system features the advanced Intel 8085 CPU, an 8355 ROM with 2k deluxe monitor/operating system, and an advanced 8155 RAM I/O ... all on a single motherboard with room for RAM/ROM/PROM/EPROM and S-100 expansion, plus generous prototyping space.

PC Board: Glass epoxy, plated through holes with solder mask. • **I/O:** Provisions for 25-pin (DB25) connector for terminal serial I/O, which can also support a paper tape reader. • **Cassette tape recorder** input and output. • **Cassette tape control** output. • **LED output indicator** on SOD (serial output) line. • **Printer interface** (less drivers). • **total of four 8-bit plus one 6-bit I/O ports.** • **Crystal Frequency:** 6.144 MHz. • **Control Switches:** Reset and user (RST 7.5) interrupt. • **additional provisions** for RST 5.5, 6.5 and TRAP interrupts on-board. • **Counter/Timer:** Programmable, 14-bit binary. • **System RAM:** 256 bytes located at F800, ideal for smaller systems and for use as an isolated stack area in expanded systems. • **RAM expandable to 64K via S-100 bus or 4k on motherboard.**

System Monitor (Terminal Version): 2k bytes of deluxe system monitor ROM located at F900, leaving 4000 free for user RAM/ROM. Features include tape load with labeling ... examine/change contents of memory ... insert data ... warm start ... examine and change all registers ... single step with register display at each break point, a debugging/training feature ... go to execution address ... move blocks of memory from one location to another ... fill blocks of memory with a constant ... display blocks of memory ... automatic baud rate selection to 9600 baud ... variable display line length control (1-255 characters/line) ... channelized I/O monitor routine with 8-bit parallel output for high-speed printer ... serial console in and console out channel so that monitor can communicate with I/O ports.

System Monitor (Hex Keypad/Display Version): Tape load with labeling ... tape dump with labeling ... examine/change contents of memory ... insert data ... warm start ... examine and change all registers ...

single step with register display at each break point ... go to execution address. Level "A" in this version makes a perfect controller for industrial applications, and is programmed using the Netronics Hex Keypad/Display. It is low cost, perfect for beginners.

HEX KEYPAD/DISPLAY SPECIFICATIONS

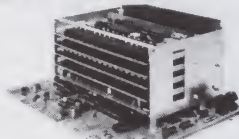
Calculator type keypad with 24 system-defined and 16 user-defined keys. Six digit calculator-type display, that displays full address plus data as well as register and status information.

LEVEL "B" SPECIFICATIONS

Level "B" provides the S-100 signals plus buffers/drivers to support up to six S-100 bus boards, and includes: address decoding for on-board 4k RAM expansion selectable in 4k blocks ... address decoding for on-board 8k EPROM expansion selectable in 8k blocks ... address and data bus drivers for on-board expansion ... wait state generator (jumper selectable), to allow the use of slower memories ... two separate 5 volt regulators.

LEVEL "C" SPECIFICATIONS

Level "C" expands Explorer/85's motherboard with a card cage, allowing you to plug up to six S-100 cards directly into the motherboard. Both cage and card are neatly contained inside Explorer's deluxe steel cabinet. Level "C" includes a sheet metal superstructure, a 5-card, gold plated S-100 extension PC board that plugs into the motherboard. Just add required number of S-100 connectors.



Explorer/85 With Level "C" Card Cage.

LEVEL "D" SPECIFICATIONS

Level "D" provides 4k of RAM, power supply regulation, filtering decoupling components and sockets to expand your Explorer/85 memory to 4k (plus the origi-

nal 256 bytes located in the 8155A). The static RAM can be located anywhere from 0000 to EFFF in 4k blocks.

LEVEL "E" SPECIFICATIONS

Level "E" adds sockets for 8k of EPROM to use the popular Intel 2716 or the TI 2516. It includes all sockets, power supply regulator, heat sink, filtering and decoupling components. Sockets may also be used for 2k x 8 RAM IC's (allowing for up to 12k of on-board RAM).

DISK DRIVE SPECIFICATIONS

- 8" CONTROL DATA CORP professional drive.
- LSI controller.
- Write protect.
- Single or double density.
- Data capacity: 401,016 bytes (SD), 802,032 bytes (DD), unformatted.
- Access time: 25ms (one track).

DISK CONTROLLER/I/O BOARD SPECIFICATIONS

- Controls up to four 8" drives.
- 1771A LSI (SD) floppy disk controller.
- On-board data separator (IBM compatible).
- 2 Serial I/O ports.
- Autoboot to disk system when system reset.
- 2716 PROM socket included for use in custom applications.
- On-board crystal controlled.
- On-board I/O baud rate generators to 9600 baud.
- Double-sided PC board (glass epoxy.)

DISK DRIVE CABINET/POWER SUPPLY

- Deluxe steel cabinet with individual power supply for maximum reliability and stability.

ORDER A COORDINATED EXPLORER/85 APPLICATIONS PAK!

Beginner's Pak (Save \$26.00!) — Buy Level "A" (Terminal Version) with Monitor Source Listing and AP-1 5-amp Power Supply: (regular price \$199.95), now at SPECIAL PRICE: \$169.95 plus post. & insur.

Experimenter's Pak II (Save \$53.40!) — Buy Level "A" (Hex Keypad/Display Version) with Hex Keypad/Display, Intel 8085 User Manual, Level "A" Hex Monitor Source Listing, and AP-1 5-amp Power Supply: (regular price \$279.35), all at SPECIAL PRICE: \$219.95 plus post. & insur.

Special Microsoft BASIC Pak (Save \$103.00!) — Includes Level "A" (Terminal Version), Level "B", Level "D" (4k RAM), Level "E", 8k Microsoft in ROM, Intel 8085 User Manual, Level "A" Monitor Source Listing, and AP-1 5-amp Power Supply: (regular price \$439.70), now yours at SPECIAL PRICE: \$329.95 plus post. & insur.

ADD A TERMINAL WITH CABINET. GET A FREE RF MODULATOR: Save over \$114 at this SPECIAL PRICE: \$499.95 plus post. & insur.

Special B" Disk Edition Explorer/85 (Save over \$104!) — Includes disk-version Level "A", Level "B", two S-100 connectors and brackets, disk controller, 64k RAM, AP-1 5-amp power supply, Explorer/85 deluxe steel cabinet, cabinet fan, 8" SD/DD disk drive from famous CONTROL DATA CORP. (not a hobby brand!), drive cabinet with power supply, and drive cable set-up for two drives. This package includes everything but terminal and printers (see coupon for them). Regular price \$1630.30, all yours in kit at SPECIAL PRICE: \$1499.95 plus post. & insur. Wired and tested, only \$1799.95.

Special! Complete Business Software Pak (Save \$625.00!) — Includes CP/M 2.0, Microsoft BASIC, General Ledger, Accounts Receivable, Accounts Payable, Payroll Package: (regular price \$1325), yours now at SPECIAL PRICE: \$699.95.

Please send the items checked below:

- ☐ Explorer/85 Level "A" kit (Terminal Version) ... \$129.95 plus \$3 post. & insur.
- ☐ Explorer/85 Level "A" kit (Hex Keypad/Display Version) ... \$129.95 plus \$3 post. & insur.
- ☐ 8k Microsoft BASIC on cassette tape. \$64.95 postpaid.
- ☐ 8k Microsoft BASIC in ROM kit (requires Levels "B", "D" and "E") ... \$90.95 plus \$2 post. & insur.
- ☐ Level "B" (S-100) kit ... \$49.95 plus \$2 post. & insur.
- ☐ Level "C" (S-100 6-card expander) kit ... \$39.95 plus \$2 post. & insur.
- ☐ Level "D" (4k RAM) kit ... \$60.95 plus \$2 post. & insur.
- ☐ Level "E" (EPROM ROM) kit ... \$3.95 plus \$06 p&h.
- ☐ Deluxe Steel Cabinet for Explorer/85 ... \$49.95 plus \$3 post. & insur.
- ☐ Fan For Cabinet ... \$15.00 plus \$1.50 post. & insur.
- ☐ ASCII Keyboard/Computer Terminal kit: features a full 128 character set, u&l case; full cursor control; 75 ohm video output; convertible to baudot output; selectable baud rate, RS232-C or 20 ma. I/O. 32 or 64 character by 16 line formats, and can be used with either a CRT monitor or a TV set (if you have an RF modulator) ... \$149.95 plus \$3.00 post. & insur.
- ☐ Deluxe Steel Cabinet for ASCII keyboard/terminal ... \$19.95 plus \$2.50 post. & insur.
- ☐ New! Terminal/Monitor: (See photo) Same features as above, except 12" monitor with keyboard and terminal is in deluxe single cabinet kit ... \$399.95 plus \$7 post. & insur.
- ☐ Hazeltine terminals: Our prices too low to quote — CALL US
- ☐ Lear-Sigler terminals/printers: Our prices too low to quote — CALL US
- ☐ Hex Keypad/Display kit ... \$60.95 plus \$2 post. & insur.

- ☐ AP-1 Power Supply Kit ±BV @ 5 amps) in deluxe steel cabinet ... \$39.95 plus \$2 post. & insur.
- ☐ Gold Plated S-100 Bus Connectors ... \$4.85 each, postpaid.
- ☐ RF Modulator kit (allows you to use your TV set as a monitor) ... \$8.95 postpaid.
- ☐ 16k RAM kit (S-100 board expands to 64k) ... \$199.95 plus \$2 post. & insur.
- ☐ 32k RAM kit ... \$299.95 plus \$2 post. & insur.
- ☐ 48k RAM kit ... \$399.95 plus \$2 post. & insur.
- ☐ 64k RAM kit ... \$499.95 plus \$2 post. & insur.
- ☐ 16k RAM Expansion kit (to expand any of the above in 16k blocks up to 64k) ... \$99.95 plus \$2 post. & insur. each.
- ☐ Intel 8085 CPU Users' Manual ... \$7.50 postpaid.
- ☐ 12" Video Monitor (10MHz bandwidth) ... \$139.95 plus \$5 post. & insur.
- ☐ Beginner's Pak (see above) \$169.95 plus \$4 post. & insur.
- ☐ Experimenter's Pak (see above) ... \$219.95 plus \$6 post. & insur.
- ☐ Special Microsoft BASIC Pak Without Terminal (see above) ... \$329.95 plus \$7 post. & insur.
- ☐ Same as above, plus ASCII Keyboard Terminal With Cabinet, Get Free RF Modulator (see above) ... \$499.95 plus \$10 post. & insur.
- ☐ Special B" Disk Edition Explorer/85 (see above) ... \$1499.95 plus \$26 post. & insur.
- ☐ Wired & Tested ... \$1799.95 plus \$26 post. & insur.
- ☐ Extra 8" CDC Floppy Drives ... \$499.95 plus \$12 post. & insur.
- ☐ Cabinet & Power Supply For Drive ... \$609.95 plus \$3 post. & insur.
- ☐ Drive Cable Set-up For Two Drives ... \$25 plus \$1.50 post. & insur.

- ☐ Disk Controller Board With I/O Ports ... \$199.95 plus \$2 post. & insur.
 - ☐ Special! Complete Business Software Pak (see above) ... \$699.95 postpaid.
- SOLD SEPARATELY:
- ☐ CP/M 1.4 ... \$100 postpaid.
 - ☐ CP/M 2.0 ... \$150 postpaid.
 - ☐ Microsoft BASIC ... \$325 postpaid.
 - ☐ Intel 8085 CPU User Manual ... \$7.50 postpaid.
 - ☐ Level "A" Monitor Source Listing ... \$25 postpaid.

Dept. KB3

Continental U.S.A. Credit Card Buyers Outside Connecticut
CALL TOLL FREE: 800-243-7428

To Order From Connecticut Or For Technical Assistance, call (203) 354-9375

Total Enclosed (Conn res. add sales tax) \$ _____
Paid By:

☐ Personal Check ☐ Cashier's Check/Money Order
☐ VISA ☐ Master Charge (Bank No. _____)
Acct. No. _____ Exp. Date _____
Signature _____
Print _____
Name _____
Address _____
City _____
State _____ Zip _____

NETRONICS Research & Development Ltd.
333 Litchfield Road, New Milford, CT 06776

Best Prices and Delivery!

SUPERBRAIN by Intertec



Self contained computer with dual disks and two RS232C ports. Complete with CP/M 2.2 and BASIC.

32K Double Density, List \$2995 **\$2685**

64K Double Density, List \$3345 **\$2883**

64K Upgraded to Quad Density w/ Special MiniMicroMart Warranty **SPECIAL \$3395**

VIDEO TERMINALS

NEW EMULATOR (Intertec), List \$895 **\$ 749**

NEW INTERTUBE III List \$895 **ONLY \$ 749**

SOROC 120, List \$995 **SPECIAL \$ 729**

10140, List \$1495 **SPECIAL \$1149**

PERKIN-ELMER 550, List \$997 **\$ 799**

with anti-glare screen, \$1027 **\$ 829**

HAZELTINE 1410, List \$900 **\$ 749**

1420 **\$ 849**

1500, List \$1225 **\$ 879**

1510, List \$1395 **\$ 1089**

1520, List \$1650 **\$1389**

LEAR SIEGLER ADM3A, Assembled **\$ 849**

TELEVIDEO 912C, List \$950 **\$ 789**

920C, List \$1030 **\$ 849**

950C, List \$1195 **NEW \$1039**

PRINTERS

ANADEx DP-8000 **\$ 849**

DP-9500, List \$1650 **\$1399**

DP-9501, List \$1650 **\$1399**

PAPER TIGER IDS-445, List \$995 **\$ 695**

w/graphics op., incl. buffer, \$1195 **\$ 789**

PAPER TIGER IDS-460, List **1149**

PAPER TIGER IDS-460G List **1199**

NEW IDS PAPERTIGER 460 List 1295 **\$1149**

NEW IDS PAPERTIGER 460G List \$1394 **\$1199**

NEC Spinwriters Call for Price

TELETYPE 43 KSR **\$1087**

CENTRONICS

730-1 parallel interface **NEW LGW \$ 649**

737 parallel interface **SUPER VALUE \$ 829**

779 w/Tractor, List \$1350 **\$1049**

703 w/Tractor, VFU, List \$2975 **\$1695**

704 w/Tractor, VFU, List \$2350 **\$1595**

TI 810 Basic, List \$1895 **\$1695**

810 serial & Centronics-style

parallel interface, List \$1940 **\$1735**

810 w/full ASCII (U/LC), Vertical

Forms Control, Compressed Print **\$1895**

TI 820 KSR, List \$2165 **\$1895**

TI 745 w/full ASCII, List \$1695 **\$1399**

COMPRINT 912 w/parallel interface **\$ 559**

912 w/serial interface, List \$699 **\$ 589**

AXIOM IMP I **\$ 699**

MICROTEK, List \$750 **\$ 675**

OKIDATA Microline 80, List \$949 **\$ 599**

Tractor Feed Option **\$109**

RS232 Serial Interface **\$ 99**

NORTH STAR HORIZON®

HORIZON 1 ASSEMBLED & TESTED

32K, Double Density, List \$2695 **\$2279**

32K, Quad Density, List \$2995 **\$2539**

HORIZON 2 ASSEMBLED & TESTED

32K, Double Density, List \$3095 **\$2619**

32K, Quad Density, List \$3595 **\$3049**

48K, Double Density, List \$3590 **\$3039**

48K, Quad Density, List \$4090 **\$3469**

64K, Double Density, List \$3830 **\$3239**

64K, Quad Density, List \$4330 **\$3669**

FLOPPY DISK SYSTEMS

NORTH STAR MDS-A

Assembled, List \$899 **SPECIAL \$ 719**

MORROW THINKER TOYS® Discus 2D,

List \$1199 **OUR PRICE \$ 998***

Discus 2D, dual-drive, List \$1994 **\$1694***

Discus 2 + 2, A&T, List \$1549 **\$1319***

Dual Discus 2 + 2, A&T, List \$2748 **\$2335***

*Now includes CP/M 2.2

Prom Programers

SSM PB1 Kit List \$125 **\$106**

SSM PB1 A&T List \$190 **\$161**

SD Computer Prom 100 Kit \$236 **\$201**

SD Computer Prom 100A&T List \$311 **\$264**

FLOPPY DISK CONTROLLER BOARDS

NORTH STAR, DD,

Assembled, List \$499 **\$399**

MORROW Disk Jockey 1, A&T (\$213) **\$189**

Disk Jockey 2D, A&T, List \$479 **\$429**

SD Versafloppy 1, Kit, List \$284 **\$239**

Versafloppy II, DD Kit, List \$413 **\$349**

Versafloppy II, DD, A&T, List \$507 **\$429**

DELTA double density A&T (\$385) **\$345**

CONDUCTOR, double density A&T **\$269**

INTERSYSTEMS FDC-2, A&T, \$495 **\$439**

MICROMATION Doubler, DD, A&T **\$429**

TARBELL Floppy Disk Interface Kit **\$199**

double density, A&T, List \$495 **\$444**

ESCON CONVERSION FOR IBM SELECTRIC

Complete w/microprocessor controller and power supply. Factory built. User installs solenoid assembly or it can be done at Escron factory at nominal cost.

Parallel (TRS 80, Sorcerer, etc.), \$575 **\$514**

RS232 Standard Serial, List \$599 **534**

IEEE-488 (for PET), List \$660 **584**

TRS-80 Cable **25**

CALIFORNIA COMPUTER SYSTEMS

Z80 CPU BOARDS List \$299 **\$269**

DISK CONTROLLER 2422 List \$399 **\$359**

16K Static, A&T, List \$349.95 **\$259**

32K STATIC List \$710 **\$599**

64K DYNAMIC BOARD List \$699 **\$589**

CPU BOARDS

(assembled unless noted)

NORTH STAR Z80A (ZPB A/A), \$299 **\$254**

CROMEMCO 4 MHz (ZPU W), List \$395 **\$335**

4 MHz (SCC W), List \$450 **\$382**

INTERSYSTEMS (formerly Ithaca Audio)

new Series II Z 80, 4 MHz, List \$395 **\$349**

SSM CB1 8080 A&T List \$252 **\$214**

CB1A Kit, List \$183 **\$156**

CB2 Z-80, A&T, List \$344 **\$289**

CB2 Kit, List \$60 **\$221**

DELTA Z 80, with I/O **\$289**

SD SBC-100, List 413 **\$349**

SBC-100 Kit, List \$341 **\$289**

SBC-200, List \$471 **\$399**

SBC-200 Kit, List \$373 **\$317**

MEMORY BOARDS

32K SD ExpandoRAM Kit

CALL FOR PRICES

NORTH STAR 16K Dynamic RAM Board,

A&T (RAM-16 A/A), List \$499 **\$420**

32K A&T (RAM-32 A/A), List \$739 **\$620**

CROMEMCO 16KZ-W, List \$495 **\$419**

64KZ-W, List \$1795 **\$1269**

MEASUREMENT SYSTEMS & CONTROLS

(Guaranteed performance, incl. labor / parts 1 yr)

DM6400 64K Board w/all 64K, \$795 **\$659**

DM4800 with 48K, List \$695 **\$650**

DM3200 with 32K, List \$595 **\$509**

DMB6400 64K Board w/all 64K **\$859**

DMB4800 with 48K **\$789**

MORROW SuperRAM — all static, all A&T

16K, 4 MHz or 2 MHz, List \$349 **\$299**

32K, 4 MHz, List \$699 **\$629**

16K Memory Master, List \$399 **\$339**

24K Memory Master, List \$549 **\$465**

INTERSYSTEMS (formerly Ithaca Audio)

8K Static 2 MHz, A&T, List \$165 **\$149**

8K Static 4 MHz, A&T, List \$195 **\$176**

16K Static 2 MHz, A&T, List \$475 **\$427**

16K Static 4 MHz, A&T, List \$495 **\$445**

64K Dynamic, List \$995 **\$895**

CALIFORNIA COMPUTER

16K Static, A&T, List \$349.95 **\$259**

VIDEO BOARDS

I/O Mapped

SD COMPUTER VDB-8024, kit, List \$437 **\$369**

Assembled, List \$556 **\$469**

XITEX SCT-100K, Kit **ONLY \$169.95**

SCT-100A Assembled **\$189.95**

SSM VB2 I/O, Kit, List \$199 **\$169**

Assembled & Tested, List \$269 **\$229**

Memory Mapped

SSM VB1C, 16x64, Kit, List \$179 **\$152**

Assembled & Tested, List \$242 **\$206**

SSM VB3, 80 Char., 4MHz, Kit, List \$425 **\$359**

4 MHz, A&T, List \$499 **\$424**

INTERSYSTEMS, 16x64, A&T, List \$165 **\$149**

*Subject to change.

NEW CROMEMCO
16FDC DOUBLE DENSITY
DISK CONTROLLER
List \$595 **OUR PRICE \$505**

SHIPPING AND INSURANCE. Add \$2.50 for boards. \$6 for Selectric Converter or Floppy Disk Drives, \$7.50 for Floppy Disk Systems, \$15 for Horizon. SHIPPED FREIGHT COLLECT. SuperBrain, Centronics and TI printers. Contact us for shipping information on other terminals and printers.

Above prices reflect a 2% cash discount (order prepaid prior to shipment). Add 2% to prices for credit card orders, C.O.D.'s, etc. Prices are subject to change and offers subject to withdrawal without notice.

— WRITE FOR FREE CATALOG —

MiniMicroMart, Inc.

1618 James Street, Syracuse NY 13203 (315) 422-4467 TWX 710-541-0431

Terminals and Printers!

TELEVIDEO TVI-912C



Upper and lower case, 15 baud rates: 75 to 19,000 baud, dual intensity, 24 x 80 character display, 12 x 10 resolution. Numeric pad. Programmable reversible video, auxiliary port, self-test mode, protect mode, block mode, tabbing, addressable cursor. Microprocessor controlled, programmable underline, line and character insert/delete. "C" version features typewriter-style keyboard. List \$950

OUR PRICE \$789

920C (with 11 function keys, 6 edit keys and 2 transmission mode keys, List \$1030

ONLY \$849

New 950C \$1195 \$1039

Intertec EMULATOR

Software compatible with a Soroc IQ-120, Hazeltine 1500, ADM-3A or DEC VT-52. Features block mode transmission and printer port; 12" anti-glare screen; 18-key numeric keypad; full cursor control. List \$895

OUR PRICE \$749



NEW INTERTUBE III

List \$995 **ONLY \$749**

12" display, 24 x 80 format, 18-key numeric keypad, 128 upper/lower case ASCII characters. Reverse video, blinking, complete cursor addressing and control. Special user-defined control function keys, protected and unprotected fields. Line insert/delete and character insert/delete editing, eleven special line drawing symbols.

SOROC



IQ-120

List \$995

**SPECIAL
\$729**

IQ-140 List \$1495
SPECIAL \$1149

HAZELTINE

**1500
ONLY
\$879**



1410 w/numeric keypad, List \$900 \$749
1420 w/lower case and numeric pad 849
1510, List \$1395 1089
1520, List \$1650 1389

NEC SPINWRITER™



Terminal/Keyboard as well as
RO Printer Only models available.

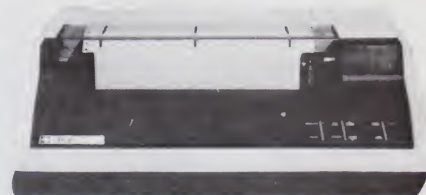
CALL FOR PRICES!

CENTRONICS PRINTERS

NEW 730-1, parallel, friction, tractor . . . \$649
NEW 730-3 RS-232 friction, tractor . . . \$699
NEW 737-1 parallel, friction, tractor . . . \$829
NEW 737-3 RS-232 friction, tractor . . . \$899
779-2 w/tractor (Same as TRS-80 Line
Printer I), List \$1350 \$849
704-11 parallel 180 cps \$1698
704-9 RS232 serial version, \$2350 . . . \$1595

Above prices reflect a 2% cash discount (order prepaid prior to shipment). Add 2% to prices for credit card orders, C.O.D.'s, etc. Prices are f.o.b. shipping point. Prices are subject to change and offers subject to withdrawal without notice. **WRITE FOR FREE CATALOG.**

TI-810



TI-810 Basic Unit, \$1895 . **ONLY \$1595**

TI-810 w/full ASCII (Lower case), vertical forms control, and compressed print . \$1795

TI-745 Complete printing terminal with acoustic coupler, List \$1695 . . . \$1399

ANADEx

DP9500/DP9501 PRINTERS

DP-9500, List \$1650 \$1349

DP-9501, List \$1650 \$1349

OKIDATA

Microline 80

ONLY \$599

Tractor Feed Option \$109

Serial interface \$ 99

AXIOM IMP I

\$699

COMPRINT 912 w/parallel interf. **\$559**

912 w/serial interface, List \$699 \$589

MICROTEK, List \$750 \$675

NEW MODELS!!!

DP 9500 \$1349

DP 9501 \$1349

PAPER TIGER®



IDS-445 Paper Tiger, \$695

w/graphics option, incl. buffer, \$1194 . . \$789

TRS-80 cable \$ 45

NEW IDS PAPERTIGER 460 List \$1295 . . \$1099

NEW IDS PAPERTIGER 460G List \$1394 . \$1149

NEW IDS 460

QUALITY PRINTING AT MATRIX

SPEED—LOGIC SEEKING

PROPORTIONAL SPACING

w/auto text justification

50

MiniMicroMart, Inc.

1618 James Street, Syracuse NY 13203 (315) 422-4467 TWX 710-541-0431



MICROCOMPUTING T.M.

LIST OF ADVERTISERS

Reader Service Number	Page	Reader Service Number	Page	Reader Service Number	Page
121 AB Computers.....	75	93 Electronic Specialists.....	75	81 Multi Business Computer Systems.....	179
273 ABM Products.....	110	272 Ellis Computing.....	89	* NRI Schools.....	47
39 AM Electronics.....	141	254 Erickson Communications.....	127	* National Computer Conference.....	137
232 Aardvark Technical Services.....	70	57 Exatron.....	134	* National Computer Shows.....	142,143
91 Aardvark Technical Services.....	147	70 FMG Corporation.....	55	* Netronics R & D Ltd.....	36,134,175
56 American Square Computers.....	185	131 FireFlyer Computing.....	64	21 OK Machine & Tool.....	75
314 Apple-Jack.....	183	191 Floppy Disk Services.....	49	62 OK Machine & Tool.....	79
334 Applied Business Computers.....	41,64	351 General Peripherals.....	66	4 Ohio Scientific.....	CIV
192 Audio Video Systems.....	193	22 Gimix Inc.....	10	130 Olensky Brothers, Inc.....	119
193 Aurora Software.....	40	42 Godbout Electronics.....	163	89 Omega Sales Company.....	123
96 Automated Equipment, Inc.....	98	236 Heath Company.....	15	140 Omnitek Systems.....	54
55 Automated Simulations.....	17	487 Hewlett-Packard.....	180	484 Open Systems.....	186
495 Axlon, Inc.....	180	340 High Sierra Software, Inc.....	136	29 Optimal Technology, Inc.....	103
99 John Bell Engineering.....	153	168 Honders Inc.....	17	310 Orange Micro.....	179
489 John Bell Engineering.....	183	33 Human Engineered Software.....	49	149 Osborne/McGraw Hill.....	21
110 CFR Associates.....	181	209 Ian Electronics.....	10	106 PAIA.....	25
256 CPU Shop.....	97	40 Instant Software.....	26,27,51,61,128,129,150,182	19 Paccom.....	101
79 C&S Electronics Mart, Ltd.....	99	77 Integrand Research Corp.....	79	274 Pacific Exchanges.....	70
356 J.A. Cambron Company Inc.....	40	76 Intelligent Systems Corporation.....	71	246 Pacific Exchanges.....	109
26 Cherry Engineering.....	70	151 Interface, Inc.....	85	153 Pacific Office Systems.....	111
97 Commerce Tours International Inc.....	64, 122	183 Interface Technology.....	57	71 Pan American Electronics.....	42
90 CompuCover.....	60	235 Interlude.....	82	98 Peek-65.....	92
43 Compumart.....	166,167	127 International Business Forms Inc.....	93	13,14,16,69,204,245 Percom Data Company, Inc.....	CII
486 CompuSoCo.....	186	195 Interpretive Education.....	39	478 Percom Data Company Inc.....	186
* Computer Broker.....	63	3 Intertec Data.....	3	266 Perry Oil & Gas.....	101
320 Computer Case Company.....	25	343 Intertec Data.....	67	11 Programma International.....	35
278 Computer Connections.....	111	180 J.E.S. Graphics.....	184	277 Programma International.....	135
475 Computer Control Systems Inc.....	186	92 J.P.C. Products.....	188	202 Progressive Computing.....	114
133 Computer CTY.....	127	126 JR Inventory Company.....	151	44 Quest Electronics.....	162
18 Computer Design Labs.....	43	48 Jade Computer Products.....	172,173	188 RAC Products.....	89
120 Computer Discount of America.....	62	41 Jameco Electronics.....	164,165	46 RKS Enterprises, Inc.....	25
152 Computer Distributors.....	140	164 Jim Pak.....	191	52 RNB Enterprises Inc.....	168
80 Computer Services.....	119	247 Joe Computer.....	85	101 Racet Computers.....	181
49 Computer Services.....	188	222 Kalglo Electronics Company Inc.....	54	* Radio Shack.....	CIII
36 Computer Shopper.....	183	223 Key Bits Inc.....	85	142 Random Access, Inc.....	79
283 The Computer Stop.....	58	* Kilobaud		* Realty Software Company.....	70
105 The Computer Stop.....	190	Microcomputing.....	20,31,81,107,158-161,184,194	20 The Robb Report.....	146
493 Computer Textile Inc.....	180	198 LNW Research.....	127	74 Rondure Company.....	40
6 Computronics.....	105	355 Leading Edge Products.....	9	496 SSM Microcomputer Products.....	183
297 Concord Computer Components.....	174	483 Richard Leary.....	189	477 Serendipity Systems Inc.....	189
271 Coosol, Inc.....	115	23 Level IV Products, Inc.....	42	208 Service Technologies Inc.....	93
492 Correlation Systems.....	180	234 Magnolia Microsystems.....	41	12 Simutek.....	132
228 Cuddly Software.....	193	165 Charles Mann & Associates.....	109	67 Sirius Systems.....	149
141 Custom Electronics, Inc.....	134	84 Mark Gordon Computers.....	108	132 68 Micro Journal.....	70
474 Cyber Associates Inc.....	188	333 Meta Media Productions Inc.....	7	66 Skyles Electric Works.....	154,155
* Cybernetics.....	114	161 Meta Technologies Corporation.....	19	257 Snapp, Inc.....	59
293 D & N Micro Products.....	70	108 Micro Architect, Inc.....	101	473 Software Resources Inc.....	189
24 The Datak Corporation.....	189	476 Micro Architect, Inc.....	189	39 The Software Toolworks.....	33
471 Datasoft.....	188	167 Micro Computer Industries.....	37	306 Spectrum Software.....	133
63 Davis Systems, Inc.....	119	260 The Microcomputer Warehouse.....	66	288 The Stocking Source.....	13
491 Digital Laboratories Inc.....	184	68 Micromail.....	41	237 Synergetic Solutions.....	179
* Digital Research Computers.....	170,171	100 Micro Management Systems.....	187	481 Syntax Corporation.....	186
* Digital Research Parts.....	115	479 Micro Mike's Inc.....	189	498 Syntest Corporation.....	182
61 Digital Systems Engineering.....	96	347 Micromint.....	104	189 Tab Sales Company.....	53
250 Discount Software Group.....	66	335 Micro Products Unlimited.....	64	350 Tang Data Corp.....	85
* Disk Supply Company.....	111	338 Micro Products Unlimited.....	92	328 Texas Computer Systems.....	181
155 Dorsett Educational Systems Inc.....	114	488 Microsette.....	182	65 Tora Systems Limited.....	190
34 Dr. Daley.....	109	* Midwest Scientific Instruments.....	156,157	95 Total Information Services.....	41
88 Dr. Daley.....	148	Mikos.....	169	* Trionyx Electronics.....	189
87 Dwo Quong Fok Lok Sow.....	150	255 Miller Microcomputer Services.....	24	263 US Robotics.....	70
494 ETC Corporation.....	182	227 Mini Micro Mart.....	176	221 US Robotics.....	98
482 E-Z Software.....	188	50 Mini Micro Mart.....	177	181 US Robotics.....	181
178 Eastern House Software.....	182	78 Minis & Micros, Inc.....	70	* VR Data Corporation.....	151
82 Ecosoft.....	184	472 Mosaic Electronic.....	188	214 VanHorn Office Supply.....	103
* Electravalue Industrial.....	104	* Mullen Computer Products.....	89	* Wameco.....	169
				163 Wintek Corporation.....	193
				122 World Wide Electronics.....	64

Reader Responsibility

One of your responsibilities, as a reader of *Kilobaud Microcomputing*, is to help increase the magazine's circulation and advertising, both of which will bring you the same benefit—a larger and even better magazine. You can help by encouraging your friends to subscribe to *Kilobaud Microcomputing*. Remember: Subscriptions are guaranteed—money back if not delighted. So no one can lose. You can also help by filling out the Reader Service card. Answer the questions in the questionnaire and circle the advertisers' Reader Service numbers for more product information. Advertisers put a lot of trust in readers' requests for information.

*This advertiser prefers to be contacted directly.

kilobaud
MICROCOMPUTING
PETERBOROUGH, NH 03458

For further information from our advertisers, please use the Reader Service card.

READER SERVICE

Please help us to bring you a better magazine—by answering these questions:

I. I am interested enough in a general-interest article to see it in lieu of a technical article.

- ☐ 1 Yes
☐ 2 No

II. The following types of general interest articles appeal to me most (check two only).

- ☐ A Humor
☐ B Interview with users/industry leaders
☐ C Historical
☐ D Essay
☐ E Profile of a business

III. As a reader of Microcomputing, I consider myself a

- ☐ 1 Beginner
☐ 2 Intermediate
☐ 3 Expert

IV. The articles in Microcomputing are

- ☐ A Too simple
☐ B Too complex
☐ C Just right

V. I want to see more industry news in Microcomputing

- ☐ 1 Yes
☐ 2 No

VI. The following major computer publication gives me the most usable information (check only one)

- ☐ A Kilobaud Microcomputing
☐ B 80 Microcomputing
☐ C Byte
☐ D Interface Age
☐ E Personal Computing
☐ F Creative Computing
☐ G Dr. Dobbs's Journal

VII. I want to see more regular departments in Microcomputing

- ☐ 1 Yes
☐ 2 No

VIII. I bought this magazine on the newsstand because (answer only if question applies)

- ☐ A I was looking specifically for Microcomputing
☐ B The cover caught my eye

IX. I want to see more of the following kinds of articles in Microcomputing (check two only)

- ☐ 1 Business
☐ 2 Construction
☐ 3 Education
☐ 4 Game
☐ 5 Home application
☐ 6 Human interest
☐ 7 Programming technique
☐ 8 Review
☐ 9 Scientific

X. Is the advertising content of the magazine a primary reason for your buying Kilobaud?

- ☐ A Yes
☐ B No

XI. What type of computer do you own? (Check all that apply)

- ☐ 1 Apple
☐ 2 PET
☐ 3 TRS-80
☐ 4 Atari
☐ 5 Heath
☐ 6 TI
☐ 7 Other

XII. If you are not a subscriber, please circle 500.

Kilobaud MICROCOMPUTING • March 1981

Reader Service: Return this card to receive full information on the products advertised in this issue. Refer to the ad. You will find numbers near the logo of each advertiser. Each represents the advertiser's individual Reader Service number. Circle the corresponding numbers on one of the cards on this page, include your name, address & zip, and drop in a mailbox. In 4-6 weeks you'll hear from the advertiser directly.

This card valid until May 31, 1981.

1	6	11	16	21	126	131	136	141	146	251	256	261	266	271	376	381	386	391	396
2	7	12	17	22	127	132	137	142	147	252	257	262	267	272	377	382	387	392	397
3	8	13	18	23	128	133	138	143	148	253	258	263	268	273	378	383	388	393	398
4	9	14	19	24	129	134	139	144	149	254	259	264	269	274	379	384	389	394	399
5	10	15	20	25	130	135	140	145	150	255	260	265	270	275	380	385	390	395	400
26	31	36	41	46	151	156	161	166	171	276	281	286	291	296	401	406	411	416	421
27	32	37	42	47	152	157	162	167	172	277	282	287	292	297	402	407	412	417	422
28	33	38	43	48	153	158	163	168	173	278	283	288	293	298	403	408	413	418	423
29	34	39	44	49	154	159	164	169	174	279	284	289	294	299	404	409	414	419	424
30	35	40	45	50	155	160	165	170	175	280	285	290	295	300	405	410	415	420	425
51	56	61	66	71	176	181	186	191	196	301	306	311	316	321	426	431	436	441	446
52	57	62	67	72	177	182	187	192	197	302	307	312	317	322	427	432	437	442	447
53	58	63	68	73	178	183	188	193	198	303	308	313	318	323	428	433	438	443	448
54	59	64	69	74	179	184	189	194	199	304	309	314	319	324	429	434	439	444	449
55	60	65	70	75	180	185	190	195	200	305	310	315	320	325	430	435	440	445	450
76	81	86	91	96	201	206	211	216	221	326	331	336	341	346	451	456	461	466	471
77	82	87	92	97	202	207	212	217	222	327	332	337	342	347	452	457	462	467	472
78	83	88	93	98	203	208	213	218	223	328	333	338	343	348	453	458	463	468	473
79	84	89	94	99	204	209	214	219	224	329	334	339	344	349	454	459	464	469	474
80	85	90	95	100	205	210	215	220	225	330	335	340	345	350	455	460	465	470	475
101	106	111	116	121	226	231	236	241	246	351	356	361	366	371	476	481	486	491	496
102	107	112	117	122	227	232	237	242	247	352	357	362	367	372	477	482	487	492	497
103	108	113	118	123	228	233	238	243	248	353	358	363	368	373	478	483	488	493	498
104	109	114	119	124	229	234	239	244	249	354	359	364	369	374	479	484	489	494	499
105	110	115	120	125	230	235	240	245	250	355	360	365	370	375	480	485	490	495	500

Name _____

Address _____

City _____

State _____

Zip _____

Microcomputing • POB 2741 • Clinton IA 52735

BOOKS

Please send me the following Microcomputing products:

Qty.	Catalog #	Title	Unit Price	Total

Add \$1 shipping/handling _____

Total _____

Please allow 4-6 weeks for delivery. No C.O.D.s accepted.

Enclosed \$ _____ ☐ Check ☐ M.O.

Bill: ☐ AE ☐ MC ☐ Visa

Card # _____ Exp. date _____

Signature _____ Interbank # _____

Name _____

Address _____

City _____

State _____ Zip _____

3/81

Microcomputing • Mail Order Dept. • Peterborough NH 03458

SUBSCRIPTION

MICROCOMPUTING
subscribers save \$10
off the
newsstand price.

☐ New subscription

☐ Renewal

☐ 1 year —\$25

☐ 2 years—\$38

☐ 3 years—\$53

Enclosed \$ _____ ☐ Check ☐ M.O.

Bill: ☐ MC ☐ Visa ☐ AE ☐ me

Card # _____ Exp. date _____

Signature _____ Interbank # _____

Name _____

Address _____

City _____ State _____ Zip _____

Canada—\$27, 1 year only. US funds

Other foreign—\$35, 1 year only. US funds

313B9

Microcomputing • POB 997 • Farmingdale NY 11737

kilobaud
MICROCOMPUTING

BUSINESS REPLY CARD

FIRST CLASS PERMIT NO. 217 CLINTON IA 52735

kilobaud

POSTAGE WILL BE PAID BY ADDRESSEE

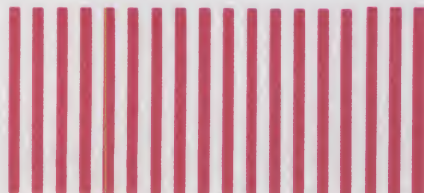
MICROCOMPUTING T.M.

POB 2741
Clinton IA 52735

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES



NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES



BUSINESS REPLY CARD

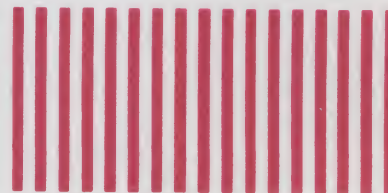
FIRST CLASS PERMIT NO. 1024 PETERBOROUGH NH 03458

kilobaud POSTAGE WILL BE PAID BY ADDRESSEE

MICROCOMPUTING T.M.

Subscription Dept.
POB 997
Farmingdale NY 11737

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES



BUSINESS REPLY CARD

FIRST CLASS PERMIT NO. 1024 PETERBOROUGH NH 03458

kilobaud POSTAGE WILL BE PAID BY ADDRESSEE

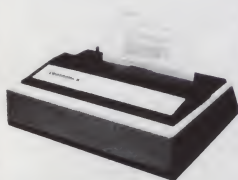
MICROCOMPUTING T.M.

Peterborough NH 03458

Att. Mail Order

CENTRONICS 737 (RADIO SHACK LINE PRINTER IV)

Word Processing Print Quality



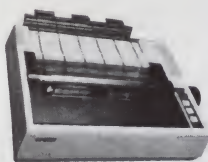
- 18 x 9 dot matrix; suitable for word processing • Underlining • proportional spacing • right margin justification • serif typeface • 50/80 CPS • 9½" Pin Feed/Friction feed • Reverse Platen • 80/132 columns

CENTRONICS 737-1 (List \$995) **\$780**
CENTRONICS 737-3 (List \$1045) **\$830**

EPSON MX80

Low-Priced

Professional Print Quality



- 9 x 9 dot matrix • Lower case descenders • 80 CPS • Bidirectional, Logic seeking • 40, 66, 80, 132 columns per line • 64 special graphic characters: TRS-80 Compatible • Forms handling • Multi-pass printing • Adjustable tractors

EPSON MX80 (List \$645) **\$Call**



TELEVIDEO CRT'S PRICES SLASHED!

TVI 912C } Please Call Toll Free
TVI 920C } Prices are too low to
TVI 950 } advertise

QUANTITY PRICING AVAILABLE

PRINTERS

ANACOM 150 150 CPS, wide carriage, 9 x 9 dot (List \$1350) **\$ Call**
ANADIX 9500 wide carriage, graphics (List \$1650) **\$1450**
VISTA V300 (C. ITOH) Typewriter quality, daisy wheel (List \$1895) **\$1795**
BASE 2 850 graphics printer (List \$799) **749**
OKIDATA MICROLINE 80 (List \$800) **599**
NEC 5530-5 letter quality, RO, parallel, tractors (List \$2970) **\$2599**
MALIBU Dot graphics, 132 Col, Letter quality **\$ Call**
PAPER TIGER IDS 445 & 460 with graphics & 2K buffer **\$ Call**
QUME 5/45 Typewriter quality (List \$2905) **2559**

INTERFACE EQUIPMENT

APPLE II — BASE 2 parallel graphics interface board **160**
SSM AIO BOARD Serial/Parallel interface board (List \$225) **175**
TRS-80 CABLES expansion interface or direct **\$ Call**

TOLL FREE (800) 854-8275

CA, AL, HI (714) 630-3322

Call for FREE CATALOG

Phone orders WELCOME. Same day shipment for VISA, MASTER CHARGE, and AMERICAN EXPRESS. Personal checks require 2 weeks to clear. Add 3% for shipping and handling. California residents add 6%. Manufacturer's warranty included. Prices subject to revision.

Orange Micro, Inc.
3148 E. La Palma, Suite E
Anaheim, CA 92806

NORTH STAR HORIZON:
HRZ-2-32K-D-Factory ASM.....\$2275
HRZ-2-32K-Q-Factory ASM.....\$2675
64K DD or Q Also Available
HDS-18-F.....\$4449
Medical-Dental SYS.....\$2500
HP-85A SPECIAL.....\$2795
HP-83.....\$2590
We carry the complete HP line.

COMMODORE (PET):
2001-32K BorN Keyboard.....\$1090
2001-16K.....\$ 859
8032 (80 Column Screen).....\$1599
2040 Dual Floppy Drive.....\$1090
8050 Dual Floppy (IMEG).....\$1599
2022 Tractor Printer.....\$ 749
Word PRO IV.....\$ 290
VISICALC.....\$ 195
APPLE II PLUS Call For Price!
ATARI 800.....\$ 849
TI 99/4 Console & Monitor.....\$ 990
INTERTEC SUPERBRAIN:
32K RAM.....\$2595
64K RAM.....\$2695

PRINTERS

Letter Quality:
NEC 5510 or 5530.....\$2550
NEC 5520 KSR.....\$2950
DIABLO 630.....\$2390
C. ITOH.....\$1690
Dot Matrix:
CENTRONICS 730.....\$ 599
CENTRONICS 737-1.....\$ 799
CENTRONICS 799.....\$ 999
EPSON MX-80.....\$ 599
PAPER TIGER 460G.....\$1250
PAPER TIGER 445G.....\$ 820

DISPLAY TERMINALS

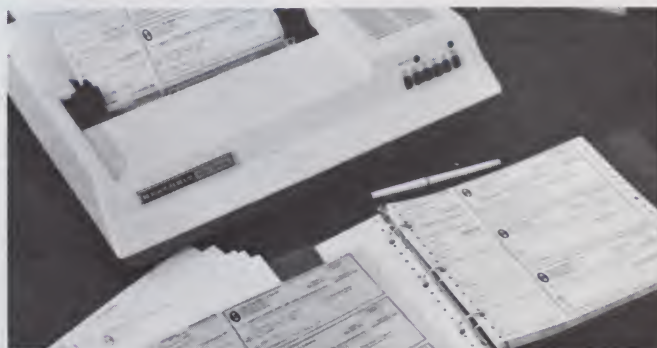
HAZELTINE 1420.....\$ 949
HAZELTINE 1500.....\$ 999
INTERTUBE III.....\$ 775
TELEVIDEO 920C.....\$ 849

Complete sales and service since 1977. Most items in stock, prices are subject to change. Visa and Master Charge Welcome.

Multi Business Computer Systems Inc.

28 Marlborough St. Portland, CT 06480 ✓ 81
(203) 342-2747 TWX/TELEX 710-428-6345

Mon. thru Fri. 9:00 - 6:00
Sat. 9:30 - 3:00



NOW...Continuous Checks

*That Can Be Used With or Without Your Computer! |
The Best in A Home Checking System*

That's right. Continuous Checks in a 3-to-a-page desk set design that can be computer printed or handwritten - just as you now do your present home checks.

VERSATILE

Our checks are not a high-volume business form adaptation. They're especially designed for the home or low volume user. Now, you don't have to change your check writing habits just to use your computer.

THOUGHTFUL FEATURES

Programming? Easy. All stub and check information is on the same line. No need to change tractor width either. Our checks are standard 9½" width for tractor feed printers.

COMPLETE HOME SYSTEM

When you've finished printing your monthly checks on your computer, store your checks and stubs in our attractive Data Ring Binder Checkbook. Later, if you have a few checks to write there's no need to load them into a printer - just write a check right there at your desk as shown above.

And, you can mail your checks in our dual windowed envelopes to eliminate addressing chores.

UNIQUE

You won't find checks like these at any bank or forms company. Even so, our special small quantity printing process will give you quality and appearance equal to any check supplier.

Color co-ordinated imprinting is standard on blue, grey, tan, or green checks. Standard imprinting and encoding is as shown above (logos and multi-color printing are optional).

Our prices are reasonable too. Two Hundred checks are just \$29.95 (envelopes \$11.95). Five Hundred checks are \$49.95 (envelopes \$23.95). Data Ring Checkbooks are only \$5.95.

Special "ORDER NOW" Offer

If you order now, we'll send you a checkbook FREE. You'll save \$5.95. Just enclose a voided check (for encoding information) with your payment. (VISA - MasterCard orders must show signature, expiration date, and account number). Or, send today for samples (sorry, we can't make this free offer on requests for samples) To:

SYNERGETIC SOLUTIONS ✓ 237
4715 SHEPHERD RD.
MULBERRY, FL 33860

New HP Business Computer Atari Expansion 12 V dc Printer PET Battery Backup

Hewlett-Packard Computer And Business Software

Hewlett-Packard, 1507 Page Mill Road, Palo Alto, CA 94304, has introduced a new microcomputer and new software for business applications.

The HP-83 comes with an integrated high-resolution CRT and keyboard, enhanced BASIC language and graphics capabilities. Designed for business and technical professionals, it is identical to the HP-85 except that it does not come with an integrated tape cartridge drive and integrated thermal printer. Price is \$2250.

The business software includes the Information Management Pac, which provides a data base management tool for applications such as list keeping, inventory and reporting, and the Graphics Presentation Pac for producing charts and text for reports and overhead projection transparencies. The new software runs with both the HP-83 and HP-85. Reader Service number 487.

Daisywheel Printer

The Starwriter Daisywheel printer runs at 25 cps and features a Centronics-compatible parallel interface. This letter-quality receive-only printer uses Diablo ribbons and printwheels. It has full graphics capability (1/120-inch horizontal control, 1/48-inch vertical control) and is completely code compatible with



Hewlett-Packard's HP-83.

Gume and Diablo, so no software changes are required to use boldface, underlining and bidirectional printing. It accommodates paper widths of up to 15 inches and will furnish three clear copies. Price is \$1779.

Computer Textile, Inc., 10960 Wilshire Blvd., Suite 1504, Los Angeles, CA 90024. Reader Service number 493.

S-100 Error-Correcting Board

An S-100 error-correcting board for error correction or system problem diagnosis is available from Correlation Systems, 81 Rockinghorse Road, Rancho Palos Verdes, CA 90274. It monitors the presently existing system RAM via the bus signals, intervening to correct erroneous bus data before, it's accepted by the CPU. The board corrects all one-bit memory

errors and flags all one-bit or two-bit errors, increasing system memory reliability. All operations are performed through on-board hardware. Latched displays show the address and bit in error. Operating to 4 MHz, the board protects 64K of memory. Price is \$1295. Reader Service number 492.

Atari 32K RAM Expansion

A new memory expansion system from Axlon, Inc., 170 N. Wolf Rd., Sunnyvale, CA 94086, upgrades the Atari 400 to 32K and the Atari 800 to 48K RAM. RAMCRAM contains 16 memory chips, yielding a total of 32K of additional user program memory. It is installed in the Atari 400 by removing the top enclosure of the computer console and unplugging the 8K RAM module supplied by Atari. The RAM-

CRAM module is then plugged into the same slot. This allows you to plug in disk drives, printers and any other peripheral devices formerly compatible only with the Atari 800. Any 32K Atari 800 software on the market will run on a 400 with RAMCRAM. For the 800, putting 32K into one memory slot allows upgrading of the system to 48K with one entire slot left over for future expansion. Reader Service number 495.

North Star Floppy Subsystem

An eight-inch floppy subsystem that allows North Star users greater auxiliary storage and the ability to transfer files from 5-1/4-inch media to eight-inch media or vice versa is available from John D. Owens Associates, Inc., 12 Schubert St., Staten Island, NY 10305. This fully integrated hardware/software package is designed to operate in single or double density on eight-inch media in IBM-compatible format.

The hardware, which requires simple, plug-in installation and is completely compatible with North Star hardware, includes a Tarbell double-density controller, dual Shugart 800R drives housed in a cabinet with power supply, fan and all necessary cabling.

The software interface, DMA-DOS, is a high-speed, single-user CP/M-compatible 8080/Z-80 disk operating system that features easy-to-use commands and utilities that

TEXAS COMPUTER SYSTEMS Radio Shack

Authorized Sales Center

All Radio Shack merchandise available at a discount. Ask for our price list.

We offer the lowest prices on

TRS-80 COMPUTERS

MODEL II 64K \$3349 (Plus shipping)

All accessories for Model II available — disk expansions, printers and software.

Check out our low, low prices on these fine printers:

- ★ Anadex 9500/9501
- ★ Epson MX-80
- ★ Okidata Microline 80
- ★ The New Daisy Wheel II
- ★ Line Printer V

Special: Price our CP/M for the Model II. It offers 596 K per drive.

- ★ Payment: Money Order, Cashier's Check, Certified Check, Personal Checks require 3 weeks to clear. VISA, MASTERCARD — Add 3%.
- ★ Prices subject to change at any time.
- ★ No tax out-of-state. TX add 5%.
- ★ All items new, guaranteed by manufacturer.
- ★ Delivery subject to availability.

TEXAS COMPUTER SYSTEMS

An Authorized RADIO SHACK® Sales Center F701

Box 1174, Brady, Texas 76825

TOLL FREE Number 800-351-1473

Texas Residents 915-597-0673

More CFR Spectaculars!!!

**ASCII Parallel Input
*SELECTRIC Typewriter/Printer**
100% TRS-80 COMPATIBLE



Only
\$659.00

- Compatible w/Printer Cable or Expansion Interface
- Refurbished Selectric Printer
- Parallel Input, 15" Frame, 132 Cols.
- Upper & Lower Case Typewriter/Printer
- Complete & Ready For Use
- BCD Type Element Included
- Data Included
- Fully Formed Characters, Approx 15 CPS

Add \$20.00 for Handling & Packaging Pay Shipping When Delivered

This Month's Specials

SHUGART 901 8" Floppy Disk Drive
Used, whole, untested Data & Schematics included **2/\$499.00**
Plus Shipping

SHUGART SA400 5 1/4" Mini Floppy
Used, whole, untested Data & Schematics included **2/\$299.00**
Plus Shipping

CDC9400 (MPI BR-803) 8" Floppy Drive
Hard or Soft Sectors Used, whole, untested Data & Schematics included **2/\$399.00**
Plus Shipping

12" VIDEO MONITOR Motorola #XM-351
80x24 or 16x64 Display Requires only Composite Video input and 110/230 VAC, 50/60 Hz Tested, functional & guaranteed Data and schematics included **\$95.00..**
Plus Shipping

9" VIDEO MONITOR Motorola #XM-227
Same characteristics as above 12" video Tested, functional and guaranteed Data & Schematics included **\$79.00..**
Plus Shipping

Call For Our Bargain-Packed PERIPHERAL FLYER!!!

Prices Are Subject To Change On All Items



CFR Associates, Inc.

MAIL ORDERS: 110
Box 144, Newton, N.H. 03858
PHONE ORDERS: 617/372-8536
(Sorry, No Collect Calls)
Mastercharge & VISA Welcome

WAREHOUSE:
18 Granite St.
Haverhill, Mass. 01830

The Phone Link Acoustic Modem

Sleek . . . Quiet . . . Reliable

- Originate and Answer Modes
- 0-300 Baud • RS232C
- Self Test • 1 year warranty
- 5 Diagnostic Leds

Dealer Inquiries Invited



U.S. ROBOTICS INC.
203 N. WABASH
SUITE 1718
CHICAGO, ILL 60601
(312) 346-5650

RACET SORTS — RACET UTILITIES — RACET computes — RACET SORTS — RACET UTILITIES

HARD DISK MULTIPLEXOR WITH 10 MEG HARD DISK FOR THE TRS-80* Mod II

NOW YOU CAN HAVE THAT LARGE COMMON DATA BASE!!

- Allows up to 4 Mod II's to connect to a single controller — up to 4 hard disk drives per controller Users may access the same file simultaneously (first-come first-served)
- Uses Cameo controller and standard 10-megabyte cartridge (hard) disk drives along with RACET Hard/Soft Disk System (HSD) software
- Access times 3 to 8 times faster than floppy Mixed floppy/hard disk operation supported
- Compatible with your existing TRSDOS programs! All BASIC statements are identical
- A single file may be as large as one disk Alternate mode allows 24-million byte record range Directory expandable to handle thousands of files
- Includes special utilities — backup and copies HPURGE for multiple deletions, HDOS directory catalog system and Hard Disk Superzap FORMAT utility includes options for specifying sectors/gran platters/drive logical disk size etc

HARD DISK DRIVE & CONTROLLER \$5995 **RACET HSD Software \$400**
Call for multiuser pricing Dealers call for OEM pricing.

BASIC LINK FACILITY 'BLINK' \$25 Mod I, \$50 Mod II
Link from one BASIC program to another saving all variables! The new program can be smaller or larger than the original program in memory. The chained program may either replace the original program, or can be merged by statement number. The statement number where the chained program execution is to begin may be specified! (Mod I Min 32K 1-disk)

INFINITE BASIC (Mod I Tape or Disk) \$49.95
Extends Level II BASIC with complete MATRIX functions and 50 more string functions. Includes RACET machine language sorts! Sort 1000 elements in 9 seconds!! Select only functions you want to optimize memory usage.

INFINITE BUSINESS (Requires Infinite BASIC) \$29.95
Complete printer pagination controls — auto headers, footers, page numbers. Packed decimal arithmetic — 127 digit accuracy +, -, *, / Binary search of sorted and unsorted arrays. Hash codes

*TRS 80 IS A REGISTERED TRADEMARK
OF TANDY CORPORATION
CHECK, VISA, M/C, C.O.D., PURCHASE ORDER
TELEPHONE ORDERS ACCEPTED (714) 637-5016

RACET COMPUTES
702 Palmdale, Orange, CA 92665

RACET SORTS — RACET UTILITIES — RACET computes — RACET SORTS — RACET UTILITIES

Are You Sitting on a Gold Mine?

Thousands of computerists have written programs and could be receiving royalty checks every month but they aren't...and won't, until they do something about publishing their programs.

Have you written any microcomputer programs that may be useful to others? Few applications or utilities are unique so the chances are excellent that many of the programs you have written are marketable, RIGHT NOW!

What kind of programs? Just about anything that others can use such as business, scientific, utility, educational, and games programs. Which microcomputer? Instant Software publishes programs for ALL popular microcomputer systems. (Instant Software also converts programs for use on other microcomputer systems and translates them into other languages, such as German, French, Italian, etc., for our international market).

Instant Software can transform your programs into royalty checks. We've set the standard for royalties to programmers. We have the publishing know-how, a world-wide distribution network and can do the most for you in selling the product of your genius.

Submit your programs on tape or disk, with complete documentation, to: Instant Software, Inc., Submissions Dept., Peterborough, NH 03458. If we can't use your program, you should hear from us in a few days. The good news takes a bit longer, but comes in the form of royalty checks.

Instant Software™

Peterborough, N.H. 03458 ✓40

ROM
OR ON
CASSETTE

THE PET RABBIT

4.0
OR
3.0 ROMS

The PET Rabbit is a programmers aid which provides 12 additional commands that can be executed in BASIC's direct mode. In addition to the commands, automatic repeat of any key held down for 0.5 seconds is also provided. This will greatly aid inputting of characters and provide more convenient cursor control. Most importantly, the RABBIT's high speed recording technique allows an 8K program to be saved in 38 seconds instead of the normal 2 minutes and 44 seconds in Commodore's format. (Note—The RABBIT cannot be used to store data tapes from BASIC.)

The PET Rabbit is 2K of machine code supplied on cassette or in ROM. The cassette version occupies the top-most portion of memory and can be ordered in one of 5 locations: \$1800-\$1FFF for 8K PETs, \$3000-\$37FF for \$3800-\$3FFF for 16K PETs, and \$7000-\$77FF or \$7800-\$7FFF for 32K PETs. The reason for two different versions for the 16K and 32K PETs is to provide room for those programmers who use the DOS Support (wedge) program. (Note—The cassette RABBIT works only with 3.0 ROM PET's.)

The ROM version is a 24 pin Integrated Circuit which plugs into spare socket D4 and occupies memory \$A000-\$A7FF. Since the ROM version does not occupy user RAM, it will work with any 8K, 16K, or 32 K 3.0 or 4.0 ROM PET. The main advantage of the ROM Rabbit is that it doesn't have to be loaded each time you power up your PET and it does not occupy valuable RAM memory.

The PET RABBIT's high-speed cassette recording feature will not work with some of Commodore's older cassette decks. To be specific, cassette decks with the lift top lid (termed old style) will not work but all other features will work. In addition, we have discovered that some new style cassette decks will not work properly. How do you know if your cassette will work? Simple—open up the cassette deck and look at the printed circuit board components. If there are IC packages for all the active components, it will work with the RABBIT. If there are any transistors on the board, it will not work. Most new style cassette decks will work okay since there are very few of the transistor types. If you wish to purchase ROM RABBIT and a cassette deck, we can offer an attractive discount.

The RABBIT commands are:

SS — Save with short leader	D — Convert decimal # to hex #
SL — Save with long leader	H — Convert hex # to decimal #
L — Load a program	Z — Toggle character set
V — Verify a program	K — Kill the RABBIT
E — Load and then run	* — Go to monitor
T — RAM memory test	G — go to machine language program

RABBIT works with the PROGRAMMERS TOOL KIT.

CASSETTE RABBIT - \$29.95 EASTERN HOUSE SOFTWARE
ROM RABBIT - \$49.95 3239 Linda Dr.
(specify memory, 3.0 or 4.0) Winston-Salem, N. C. 27106

✓178

allow extensive control over processing activity. Price is \$1910. Reader Service number 490.



Syntest's dot matrix printer.

Printer for 12 V dc Operation

For the computerist on the go, Syntest Corporation, 169 Millhan St., Marlboro, MA 01752, offers the SP-314 dot matrix alphanumeric printer that operates on 12 V dc power, thus allowing complete independence from conventional power sources. This unit features buffered 40-column impact printing on 4.25-inch paper, RS-232 serial and parallel inputs, crystal-controlled baud rate, 96-character ASCII set plus double width and a self-test routine. This 8.5 × 5.75 × 8.5 inch unit weighs 5.5 lbs. and includes graphics capabilities. Price is \$605. Reader Service number 498.

Short-Length Cassettes

Microsette Co., one of the first companies to recognize the need for short-length cassettes in the microcomputer market, has added the C-60

and the C-90 length cassettes to its product line, which features the C-10 (50 ft.) and the C-20 (100 ft.) lengths already available. The C-60 measures 290 ft., and the C-90 is 435 ft.

Microsette Co., 475 Ellis St., Mountain View, CA 94043. Reader Service number 488.

Battery Backup for PET

Battery backup systems for the Commodore PET and Dual Disk Floppy Drive are available from ETC Corporation, PO Box G, Apex, NC 27502.

Backpack, designed to install within the CPU case, gives six to ten minutes of full power (CRT included) to the PET during power outages and glitches in power lines, allowing you time to save data or programs to disk or tape. Batteries are recharged from the PET's own internal power supply. Price is \$225.

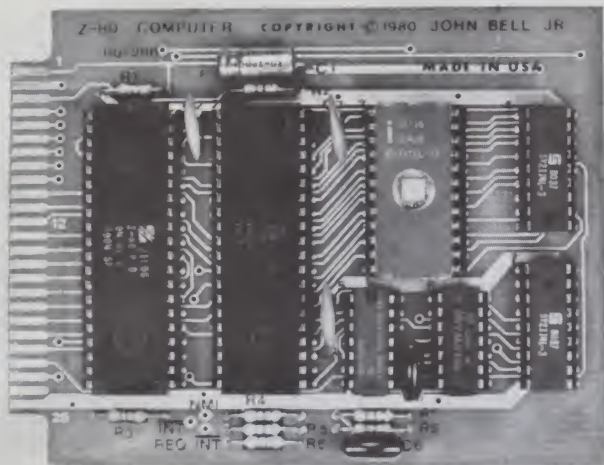
Floppy Backpack, used in conjunction with Backpack, gives 15 to 20 minutes of reserve power for both of Commodore's floppy drives. It allows you to save data and programs during power outages and also eliminates possible disk crashes. Designed to install within the disk cabinet with no wiring changes, the batteries are recharged from the disk internal power supply. Price is \$135. Reader Service number 494.

Z-80 Single-Board Computer

John Bell Engineering's Z-80-based single-board dedi-



Microsette's cassettes.



John Bell's Z-80 microcomputer.

cated computer, designed for control functions, is software-compatible with the Z-80, 8080 and 8085 microprocessors. This Z-80 microcomputer uses a Z-80 PIO chip that has two independent eight-bit bidirectional peripheral interface ports with handshake and data transfer control. It can be interrupt-driven. It uses one 2716 for EPROM memory and two 2114 RAMs and requires a single 5V power supply at 300 mA. Prices are \$129.95 (assembled and tested), \$119.95 (kit) and \$29.95 (bare board).

John Bell Engineering, PO Box 338, Redwood City, CA 94064. Reader Service number 489.

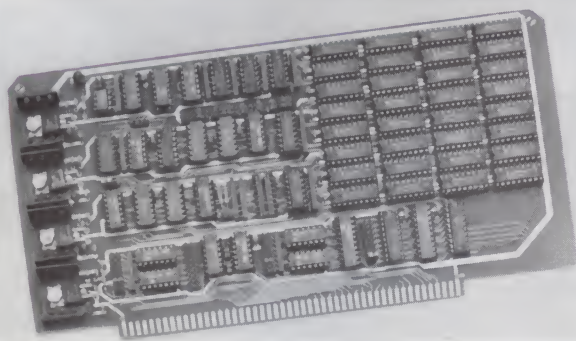
8/16-Bit Memory Board

The MB10, from SSM Microcomputer Products, 2190 Paragon Drive, San Jose, CA 95131, is a 4 MHz 16K static RAM memory board that fea-

tures extended addressing and IEEE-standard protocol. Extended addressing allows the use of multiple boards in the same configuration with as much as 16 megabytes of memory. For those applications requiring bank switching, the MB10 is jumper selectable to any I/O address with enable/disable on power-up or reset (Cromemco-compatible). Automatic 16-bit request and acknowledge protocol allows mixing 16-bit and eight-bit microprocessors in the same mainframe. It supports the new SSM CB2 Z-80 CPU board and will also operate an 8K-word RAM board for future 16-bit microprocessors. Price is \$399. Reader Service number 496.

Panel Meter-to-RS-232C Converter

The Model DPT-415 is a digital panel meter-to-RS-232C converter module that accepts parallel inputs and gen-



SSM's 16K RAM board.

COMPUTER EQUIPMENT & SOFTWARE BARGAINS



EVERY MONTH

BUY, SELL OR TRADE ALL TYPES OF COMPUTER EQUIPMENT AND SOFTWARE (pre-owned and new) among 20,000 readers nationwide.

FEATURES:

- Low classified ad rates - 10¢ a word
- Hundreds of ads from individuals
- Categorized ads so you can find them instantly
- Large (11 by 14") easy to read pages

Subscribe now for \$10 and receive 13 issues/year (one FREE plus 12 regular issues). After receiving your first issue if you're not completely satisfied you may have a 100% refund and you still keep the first issue free. Bank cards accepted.

BONUS: If you have something to advertise (pre-owned or software) send in a classified ad with your subscription and we'll run it FREE.

The Nationwide Marketplace for Computer Equipment
COMPUTER SHOPPER ✓ 36
 P.O. BOX F 21 • TITUSVILLE, FL 32780 • 305-269-3211

MasterCard & VISA subscriptions only, call TOLL FREE 1-800-528-6050 EX. 184

APPLE — JACK

New!

the graphics & games people

Super Starbase Gunner

\$19.95
DISK



\$19.95
DISK

Most shoot-em-up target games are 2-D shoot across the screen type, and quite frankly there is a glut of inferior ones. A need for a new approach exists, such as fast 3-D HIRES simulations with clever and complex challenges. How about shooting into the screen, into 3-D space, where the target is mathematically many feet behind the screen surface? How about computer intelligent targets that shoot back and use strategy and learn? How about all this and the best attributes of the more popular games? Let's include high score, 10 levels of play, snappy sound effects, colorful explosions and real time graphics. Why not go all the way and have a three dimensional gunsight? A real space battle simulation... Nah... no one would believe it or could even write it. Right? **WRONG!! WE HAVE IT...** and it is **SUPER STARBASE GUNNER**. We are very excited about this product because it is all the things we wish we had and didn't. And you can have it now with this introductory offer.

SUPER STARBASE GUNNER DISK... \$19.95 48K with APPLESOFT ROM

AVAILABLE FROM YOUR DEALER OR DIRECT FROM
APPLE—JACK, BOX 51, CHERRY VALLEY, MA 01611
 ✓ 314 (INQUIRIES INVITED)

is HARD COPY STORAGE a problem?

KILOBAUD MICROCOMPUTING, as thick as it is, is more like a floppy when it comes to standing on the bookshelf. Try the **KILOBAUD MICROCOMPUTING Library Shelf Boxes**... sturdy corrugated white dirt-resistant cardboard boxes which will keep them from flopping around. We have self-sticking labels for the boxes, too, not only for **KILOBAUD MICROCOMPUTING**, but also for **73 Magazine**, **80 MICROCOMPUTING**... and for **CQ**, **QST**, **Ham Radio**, **Personal Computing**, **Radio Electronics**, **Interface Age**, and **Byte**. Ask for whatever stickers you want with your box order. They hold a full year of **KILOBAUD MICROCOMPUTING**, **80 MICROCOMPUTING**... or **73 Magazine**. Your magazine library is your prime reference; keep it handy and keep it neat with these strong library shelf boxes. One box (BX-1000) is \$2.00, 2-7 boxes (BX-1001) are \$1.50 each, and eight or more boxes (BX-1002) are \$1.25 each. Be sure to specify which labels we should send. Have your credit card handy and call our toll-free order number 800-258-5473, or use the order card in the back of the magazine and mail to:



kilobaud TM

MICROCOMPUTING

peterborough nh 03458



Digital Laboratories DPT-415.

erates serial outputs in a computer- or printer-compatible format. When used with a printer, it automatically counts readings and inserts extra formatting characters as required. It can replace a more costly dedicated micro-computer with associated PROM, UART and input multiplexing.

It features simple jumper-type connections that allow

the module to be interfaced with a computer or directly to a printer having up to five readings per line. Operating on less than 2 watts, the 6 1/2 inch x 4 1/2 inch unit also has 20 mA current loop provisions to interface with Teletypes. Price is \$295.

Digital Laboratories, Inc., 600 Pleasant St., Watertown, MA 02172. Reader Service number 491.

WHY USE OUR INTEGRATED ACCOUNTING SYSTEM (IAS)?

IT'S EASY TO USE. Prompts guide the user through each entry and then checks the entry to make sure only proper data are saved on the disk. It won't let you post an out-of-balance entry. IAS includes a complete users manual that tells you what each program does and how to use it. We even include a practice disk so you can begin making entries within minutes after receiving our IAS.

IT'S FAST. Our proprietary Skip Sequential™ file structure lets you save data on the disk at maximum speed without wasting disk space. We've also minimized keystrokes to make more efficient use of your operator's time.

IT GIVES YOU THE INFORMATION YOU NEED. The complete IAS package has over 30 reports, listings and file printouts so you can monitor the firm's fiscal position at all times, including instantaneous account balances. Our efficient file structure also means there's no monthly "erasing" of data files. You'll appreciate this if you're ever required to reconstruct an audit trail for some past month.

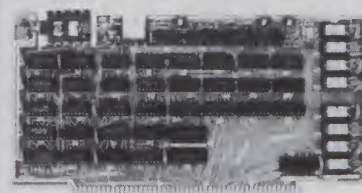
WE SUPPORT OUR SOFTWARE. Since IAS is not a translation of someone else's work, but was written by us from scratch, we know it cold. If you ever have a problem, we can answer it for you. We also give you full credit on any future packages that might replace the one you purchased. Our record over the past three years has been a good one, and we'll do everything we can to keep you a satisfied customer.

PRICE. The General Ledger costs \$125.00; the complete IAS package (GL, AP, AR and PR) is \$350.00. The user's manual is \$20.00 (refunded with purchase). Since IAS is designed for the North Star DOS and Basic and will run in as little as 32K of memory, you don't need to buy more memory, a different operating system and Basic. This savings alone could pay for the software—and then some. You can pay a lot more, but shouldn't you check us out before you do?



ECOSOFT ✓ 82
P.O. Box 68602
Indianapolis, IN 46268
(317) 283-8883
(Phone Orders Only)

Super Compuprism Color Graphics



For the S-100 Bus. 32K of on board memory allows a 288 H. x 192V. dot matrix, for a total of 55,296 pixels. Every pixel is programmable in any one of 16 colors or 16 grey levels completely independent of all other pixels in the matrix.

Compuprism Bare Board with documentation \$45, kit \$240, ass. and tested \$280.

(16K Memory 144H. x 192V.)

Super Compuprism Bare Board with documentation \$50, kit \$350, ass. and tested \$395.

(32K Memory 288H. x 192V.)

Add \$15 to A & T price for 16 level grey scale.

Add \$15 to A & T price for memory management port.

Compuprism software package, includes alphanumeric, point plot, line draw, and TRS-80* graphics simulation \$20 or FREE with A & T unit.

ALL COD ORDERS SHIPPED WITHIN 72 HOURS. 4MHz MOD FOR S.D. SYSTEMS. EXPANDORAM \$10.

**J.E.S. GRAPHICS, P.O. Box 2752
Tulsa, OK 74101, (918) 742-7104**

TRS-80* is a trademark of Tandy Corp.
SARGON II** is a trademark of Hayden Book Co.

✓ 180

Z-80 Users You Can Use TRS-80* Software

We offer an assembled hardware interface which we guarantee will load data from TRS-80* cassettes into any Z-80 based system. (Except sealed units.) The documentation explains how to patch the TRS-80* software to your system. In fact you can virtually change your Z-80 machine into a TRS-80* without making a single hardware change. The documentation also includes an example of patching SARGON II** into a Z-80 system.

The price is \$30 or FREE with the purchase of an assembled compuprism or super compuprism unit

A-D, D-A Board

S-100 board provides 16 channels of analog to digital input and 8 channels of digital to analog output. With on board kluge area. Total cost of board and parts less than \$120. Bare board with documentation \$45.

LOWEST PRICE - BEST QUALITY

NORTH STAR



North Star Horizon 2

2-5 1/4 Disk Drives
32K Double Den
Factory assem. & tested
Factory guaranteed
List 3095

only **\$2274**

**POWERFUL NORTH STAR BASIC FREE
SUPERB FOR BUSINESS & SCIENCE**

FACTORY ASSEMBLED & TESTED	LIST	ONLY
HORIZON-1-32K-DOUBLE DEN	\$2695	\$1980
HORIZON-2-32K-QUAD DENSITY	3595	2674
HORIZON-2-64K-QUAD + HARD DISK	9329	7149
HORIZON RAM ASSM 16K = \$389.		32K = \$579
HORIZON RAM KIT SALE! 16K = \$314		32K = \$469
HORIZON DISK DRIVE SALE DOUB DEN	SAVE!	315
NORTH STAR HARD DISK 18 Mb	4999	\$3929
PASCAL-PLUS 14,18 OR 36 DIGIT PRECISION		249

SUPERBRAIN ZENITH



SUPERBRAIN QD 64K

List \$3995 only \$2995



Z-89 48K

List \$2895 only \$2299

TERMINALS Z-19 \$725

INTERTUBE III only \$725

DIP-81 PRINTER only \$395



MICROTEK \$675

NEC PRINTER \$2569

TRACTOR, THIMBLE, RIBBON

InterSystems

ITHACA INTERSYSTEMS 2A



Z-80A CPU 4 MHz
64K Dynamic RAM
Front panel
V I/O—with interrupts
FDCII Disk Controller
20 slot motherboard

List \$3595 You Pay Only **\$2795**

PASCAL/Z + THE FASTEST PASCAL \$375

GET READY FOR ITHACA'S Z-8000

8086 16 BIT CPU & SUPPORT CARD SEATTLE \$575

MORROW 8" DISK

DISCUS 2D + CP/M® 600K ONLY \$938

DISCUS 2 + 2 + CP/M® 1.2 MEGA B. \$1259

ADD DRIVES 2D = \$650 2 + 2 = \$975

2D-DUAL + CP/M® + MICROSOFT BASIC = \$1555

\$2293 VALUE OVER 32% OFF!

WHILE THEY LAST



MORROW HARD DISK

26,000,000 BYTES!!

LIST \$4995 ONLY \$3995

CP/M® IS INCLUDED!

SAVE ON MEMORY AND PROGRAMS

SYSTEMS MEMORY 64K A & T 4mHz	\$599	RCA-COSMAC VP-111 99 RCA-COSMAC VP-711	\$199
SYSTEMS MEMORY 64K BANK SELECT	\$789	COLOR! RAINBOW 385	
CENTRAL DATA 64K RAM	\$599	SPECTRUM	\$289
ITHACA MEMORY 8/16-bit 64K	\$845	EZ-80 Machine Language Tutor	\$25
SEATTLE MEMORY 8/16 BIT 16K 4Mhz	\$275	EZ-CODER Translates English to BASIC	\$71
SSM KITS Z-80 CPU	\$221	ECOSOFT FULL ACCOUNTING PKG	\$315
VIDEO BRD V83 4Mhz	\$412	BOX OF DISKETTES	\$29
ANADIX PRINTER DP-9500-1	\$1349	SECRETARY WORD PROCESSOR	
CAT NOVATION MODEM	\$169	The Best! \$99	
TARBELL DISK CONTROLLER DD	\$445	TEXTWRITER III Book Writing Program	\$112
ECONORAM 2A 8K ASSM	\$179	GOFAST NORTH STAR BASIC Speeder	Upper \$71
NSSE 1-22 & P01 TERRIFIC PROGRAMS	ONLY \$10. EACH	Which Computers are BEST?	
NORTHWORD 294 MAILMAN 234		BROCHURE	FREE
INFOMAN	\$364	North Star Documentation refundable w/HRZ \$20	
TARBELL COMPUTER-PHONE			

AMERICAN SQUARE COMPUTERS BEATS ADV. PRICES

American  Computers ✓ 56

919-889-4577

KIVETT DR. JAMESTOWN N.C. 27282

919-883-1105

® CP/M is a registered trademark of Digital Research, Inc.

"Talking" Game and Business Programs

Apple II Business, Color Graphics

Office-Management Package

Accounting, Tax-Planning Software

Speech Driver and Speech Games

Percom Data Company, 211 N. Kirby, Garland, TX 75042, is now offering an advanced speech driver and eight "talking" game programs for their Speak-2-Me-2 interface. The Speak-2-Me-2 printed circuit card installs in a Texas Instruments' Speak & Spell and, by providing the interface between the Speak & Spell and a computer, allows you to add speech to business and game programs. The Speak-2-Me-2 module and software are configured for TRS-80 Models I or III, but may be adapted for other computers.

The driver program provides a direct word output routine for outputting words and phrases of the Speak & Spell vocabulary and includes routines which will create new words using syllables of Speak & Spell words and a routine which will modulate the speed at which words are spoken. The game programs are speech-enhanced by vocal prompts and responses uttered at appropriate points during play. Included among the games are Hangman, card and dice games of chance and a challenging version of Simon Says. The driver routines and game programs are supplied on diskette for \$29.95. The Speak-2-Me-2 adapter sells for \$69.95. Reader Service number 478.

Ultrasort II

Ultrasort II gives CP/M and CBASIC2 users a fast 8080/

Z-80 machine-language program to sort, merge or select records from data files, or to find the number of logical records in a file. It can be used as a stand-alone utility or as a fast subroutine called from CBASIC2. This machine-language program handles large data files rapidly and will sort records thousands of bytes long. It sorts on up to five keys, each independently ascending or descending.

Fields may be variable or fixed length. The select capability lets you either omit or include records that are less than, equal to or greater than up to four independent select keys. The program also provides prompted disk changes for work and output files.

Computer Control Systems, Inc., 298 21st Terrace S.E., Largo, FL 33541. Reader Service number 475.

Tax-Planning Program

Shortax is a tax-planning program that enables professionals to forecast and analyze federal and social security taxes in just minutes, instead of hours. The program calculates federal income tax (using tax rate tables, income averaging formula, optional maximum tax method and the corporate alternative tax calculation for long-term capital gains), the add-on minimum tax, the alternative minimum tax, the FICA tax and the self-employment tax. It also forecasts positive or negative compound growth rates or constant incremental amounts for up to 99 periods.

Data files can be stored, retrieved, recalculated, modified, listed, added together, netted against each other or deleted with menu-prompting functions.

Data input, which is cross-referenced to tax forms with on-line instructions, consists of just 20 variables. Detailed instructions are available in response to "?" or "help" input. The program runs on most microcomputer systems which use a Micropolis Disk Operating System and a CPU with at least 48K of memory; it will also run on a Radio Shack Model I, Level II with 48K of CPU memory and one (or more) Radio Shack disk drives. Program price is \$500.

Syntax Corp., 4500 W. 72nd Terrace, Prairie Village, KS 66208. Reader Service number 481.

Z-80 Accounting Software

The Software Fitness Program, written in COBOL and run under the OASIS operating system, is a set of financial accounting applications for Z-80-based microcomputers. It is designed for small-business users and includes Sales Order Processing, Accounts Receivable with Billing and Sales Analysis, Accounts Payable, General Ledger, Inventory, Payroll and Job Cost. It will run on single- or multiple-user hardware systems supporting both disk and diskette storage. Software features include open item and balance forward accounting; LIFO, FIFO and average cost methods of inventory valuation;

single or multiple company processing; revenue and expense accounting by job or phase; and a report generator for financial statements. Interface switches can be set by the user to control the complexity of accounting interactions.

Open Systems, Suite 409, 430 Oak Grove, Minneapolis, MN 55403. Reader Service number 484.

Professional Software

Professional software packages to aid the dentist, attorney and consultant in appointment scheduling, professional time management, private client billing and management reporting has recently been released by CompuSoCo, 26251 Via Roble, PO Box 2325, Mission Viejo, CA 92690.

Professional I—for the dental professional—features preparation for ADA claim forms for third-party patients and notices for dental checkups.

Professional II—geared to the needs of the legal professional—features preparation of special reports for third-party legal plans and special accounting plans to analyze court time usage and work on retainer or contingency engagements.

Professional III—a general-purpose package for consultants, accountants and contract administrators—allows the creation of sub-jobs, special cost centers, overhead accounts, billing under time and materials contracts, fixed-priced job cost accounting

MODEL II



26-4002
64K 1 Drive
\$3440.00

26-4160 1 Drive EXP. \$1035.00
26-4161 2 Drive EXP. 1575.00
26-4162 3 Drive EXP. 2115.00
26-4501 Gen. Ledger. 180.00
26-4502 Inventory. 180.00
26-4503 Payroll. 360.00
26-4554 Acct. Rec. 180.00
26-4701 Fortran. 270.00
26-1157A Daisy Wheel. . 2290.00
26-1158 Daisy Wheel II. . 1799.00



CENTRONICS

Fast 100 CPS Centronics
730 Printer. 577.00
Text Quality Centronics
737 Printer. 737.00

Model II Cobol Compiler
\$360.00
Cobol Run Time Package
\$36.00

\$ DISCOUNT \$ TRS-80® DEALER A301

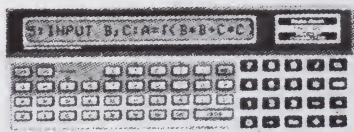
COMPUTER SPECIALISTS

26-1155 Quick Printer II. \$187.00
26-1145 RS-232 Board. 84.00
26-1140 "O" K Interface. 249.00
26-1141 "16" K Interface. 359.00
26-1142 "32" K Interface. 469.00
26-1160 Mini Disk - Drive O. 419.00
26-1161 Mini Disk - Additional. 419.00
26-1154 Lineprinter II. 699.00
26-1165 Line Printer V. 1710.00
26-1159 Lineprinter IV. 859.00
26-1166 Line Printer VI. 1080.00
26-1563 Scripsit - Disk. 79.00
26-1566 Visicalc. 83.00
26-1562 Profile. 72.00

**ALL OTHER R.S. SOFTWARE
FURNITURE, STANDS, CABLES
AND ACCESSORIES AT
DISCOUNT FROM
CATALOG PRICE.**

Novation Cat Modem. . \$149.00
CCA Data Management
System. 72.00
Adventure Games
Games 1-9 each. 14.00

Packet Computer



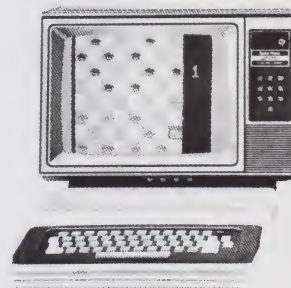
26-3501 1.9K P.C. \$225.00
26-3503 Cassette I/F. 45.00
14-812 Recorder. 72.00

MODEL III



26-1061 4K I. \$630.00
26-1062 16K III. 888.00
26-1063 32K III
2-Drives, RS232. 2225.00

COLOR



26-3001 4K. \$360.00
26-3002 16K. 540.00
26-3010 Color Video. 360.00
26-1206 Recorder. 54.00
26-3008 Joysticks. 22.50



**Acorn
Software
Products, Inc.**

GAMES:

Alien Invasion. \$9.00
Stock Market. 9.00
Star Trek. 9.00
Block Em. 9.00
Ting-Tong. 9.00

UTILITIES:

System Savers. 14.00
EDUCATION:
Language Teacher. 18.00

**FREE: COMPUTER CATALOG
UPON REQUEST**

1-800-841-0860 Toll Free Order Entry

MICRO MANAGEMENT SYSTEMS, INC. ✓100

No Taxes on Out Of
State Shipments

Immediate Shipment
From Stock on Most Items

DOWNTOWN PLAZA SHOPPING CENTER
115 C SECOND AVE. S.W.
CAIRO, GEORGIA 31728
(912) 377-7120 Ga. Phone No.

*TRS-80 is a registered trademark of the Tandy Corp.

R.S. 90 Day Limited Warranty
F-48 Form Provided

Largest Inventory
In the S.E. U.S.A.

INVENTORY CLEARANCE SALE

NEW APPLE SOFTWARE

Checkbook by Programma 48k/disk	20.00
U-DRAW II by Muse 48k/disk	35.00
Global War by Muse 48k/disk	35.00
The Voice by Muse 48k/disk	35.00
Three Mile Island Muse 48k/disk	35.00
The Best of Muse 48k/disk	35.00
Baseball by Muse 16k/cassette	10.00
Checkbook by Powersoft 48k/disk	15.00
Sublogic FS-1 32k/disk	31.00

USED TRADE-INS

TEI 11 slot S-100 box	450.00
North Star 32k D-D	1900.00
Intercolor 8001 Terminal	1200.00
TRS-80 Level II 48k, Monitor,	
RS-232, Expansion Interface,	
Cassette, Cables, Software	900.00



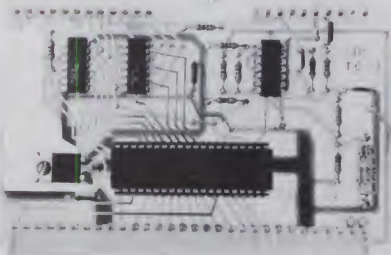
30 Hwy. 321, N.W.
P. O. Box 2292
Hickory, N. C. 28601
(704) 294-1616

PAYMENT:
MASTER CHARGE, VISA
CASH, MONEY ORDER,
UPS COD, PERSONAL
CHECKS REQUIRE 3
WEEKS TO CLEAR

PHONE HOURS:
6 PM - 9 PM EST

JPC PRODUCTS FOR

6800 COMPUTERS



High Performance Cassette Interface

- **FAST** - 4800 Baud Loads 4K in 8 Seconds!
- **RELIABLE** - Error Rate Less Than 1 in 10⁸ Bytes.
- **CONVENIENT** - Plugs Directly Into The **SWTPC**.
- **PLUS** - A Fully Buffered 8 Bit Output Port Provided.
- **LOW COST** - \$59.95 For Complete Kit.

- **OPTIONAL** - CFM/3 File Manager.
Manual & Listing \$19.95
(For Cassette Add) \$ 6.95

TERMS CASH, MC or VISA, Shipping & Handling \$3.00



Order Phone (505) 294-4623
P.O. Box 5615
Albuquerque, N.M. 87185

and many other job set-up systems.

All systems require an Apple II or Apple II Plus computer with Applesoft, a 130-column printer and at least two minifloppy disk drives. The system will handle up to 150 professional practitioners with client bases of up to 10,000 clients each. Price is \$750. Reader Service number 486.

Paintset for the Apple

Micro-Painter uses high-resolution graphics to "paint" pictures in 21 different colors on the Apple II.

Designed for computer hobbyists and professional programmers, it can be used in personal and business applications for presentations, demonstrations, computer-assisted instruction and home entertainment.

It includes a magnification feature for dot-by-dot coloring and inverse coloring. Once painted, pictures can be saved or displayed in any combination of colors or in an unpainted state. Pictures can also be repainted at any time. Price is \$34.95.

Datasoft, 16606 Schoenborn St., Sepulveda, CA 91343. Reader Service number 471.

Intelligent Terminal Emulator

Cyber-Smart is an intelligent terminal program designed to communicate with mainframe computers and with other computers that have an RS-232 port. It features a fundamental set of communication routines capable of remote intelligent terminal emulation. The program can also be configured in a master/slave mode for computer-to-computer interaction.

The program is designed for expansion and personal modification in either BASIC or machine language. It uses less than 4K of RAM and can be configured for 8K, 16K, 24K or 32K systems. It is available for the OSI cassette-based C4P computer. Price is \$29.95. An RS-232 port installation kit is available for \$14.95. The combined soft-

ware/hardware kit costs \$39.95.

Cyber Associates, Inc., PO Box 4187, Dept. M, Huntsville, AL 35802. Reader Service number 474.

Atari Graphics Editor

Plot & Draw is a graphics package for the Atari that allows you to readily generate graphics in three colors, plus a background. You can create intricate video drawings and save them on cassette tape, where they can be retrieved later by your own computer programs. Single keystroke commands and the ability to combine pictures allow you to produce complex drawings. The program continuously displays its cross-hair coordinates for precision and flexibility. It comes on 8K cassette for Atari computers equipped with a joystick. Price is \$18.

Mosaic Electronics, Box 748, Oregon City, OR 97045. Reader Service number 472.

TRS-80 Income Property Analysis

Incoprop is an income property analysis program for the TRS-80 Models I or III. Designed for real-estate brokers, sales people, counselors, educators, students and investors, the program is based upon standardized methods of property analysis used throughout the real-estate industry. It generates a property operating statement and a ten-year cash flow analysis. The use of a built-in IRS tax table ensures high accuracy of an investor's projected after-tax income stream. Minimum system requirements include 32K RAM, one disk drive and a printer. Price is \$120.

E-Z Software, PO Box 591, Novato, CA 94947. Reader Service number 482.

TRS-80 Accounts Receivable

AR, an accounts receivable system for the TRSDOS 1.2 on TRS-80 Model II, is a complete invoicing and monthly-statement-generating system which keeps track of current and aged accounts receivable.

AR enables you to speed collections and spot potential losses early enough to take action. This package maintains a file consisting of the customer's name, address and phone number, along with the customer's type of account (open item, balance forward or auto billing), current balance, tax rate and other useful account status information. It uses a full 80-column screen and requires 64K memory and dual disk systems. Price for the eight-inch diskette program is \$129.

Micro Architect, Inc., 96 Dothan St., Arlington, MA 02174. Reader Service number 476.

6502 Disk Operating System

DOS/65 is an operating system for the 6502 family of processors. It uses a layered structure like CP/M so that each user's peculiar hardware and software environment can be accommodated with minimal effort. System requirements include an eight-

inch IBM-compatible drive and controller, a console input device and a console output device, as well as a minimum of 16K to 24K RAM, depending upon the host system. In addition to the basic operating system, the diskette contains a disk file text editor, a disk-based two-pass assembler, a debugger, a system generation routine and other transient utilities.

Richard A. Leary, 1363 Nathan Hale Drive, Phoenixville, PA 19460. Reader Service number 483.

North Star Z-80 BASIC

Now the North Star Horizon can execute programs 25-30 percent faster with Bazic, a software package with all the same functions, as well as several additional features, provided by North Star BASIC. Written in Z-80 code, Bazic features increased speed and more compact code, requiring less memory than BASIC. Bazic simplifies pro-

gramming with the use of APPEND as a command or as an executable statement in a program. It also provides functions to assist in screen formatting. The Bazic version using North Star DOS as the disk operating system is available on 5-1/4-inch disk for North Star double-density/quad-capacity systems for \$150.

Micro Mike's, Inc., 905 South Buchanan, Amarillo, TX 79101. Reader Service 479.

Instructor Gradebook for the Apple II

Now educators at every grade level can record and report individual and class performance for classes of up to 400 students and statistically measure the effectiveness of teaching and evaluation techniques with the Instructor Gradebook from Serendipity Systems, Inc., 225 Elmira Road, Ithaca, NY 14850. Designed for the Apple II Plus or

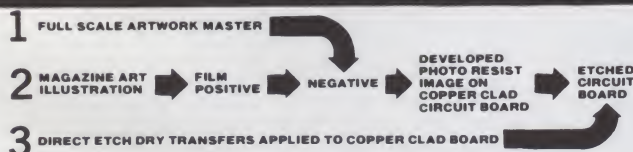
the Apple II with Applesoft firmware, Instructor Gradebook offers seven defined and two optional grading categories (e.g., test, homework, quiz). Marks can be entered either as numbers or as letter grades. Reports available include alphabetized class lists, grade listings by student ID numbers for posting individual performance reports and permanent class records. Price is \$169. Reader Service number 477.

Business Graphics For the Apple

Trend-Spotter is an easy-to-use business graphics and analysis for the Apple II Plus computer. It allows you to spot emerging trends through quick manipulation and graphing of business data. It will generate and read VisiCalc-compatible files. Price is \$275.

Software Resources, Inc., 44 Brattle Street, Cambridge, MA 02138. Reader Service number 473.

PHOTO ETCHTM PRINTED CIRCUIT KIT Makes circuits **THREE WAYS**



Copy circuits right from a magazine using special photo film. No camera or darkroom used. Page is not destroyed in process.

Do your own master art, make negatives, sensitize boards and etch one or a hundred circuits; all identical, all perfect.

For one-of-a-kind PC's, use special dry transfer patterns as a direct etch resist right on the blank copper board.

Do it all with the ER-4. In stock at parts distributors or order direct. Add 7% shipping. Minimum factory order: \$30.00.

ER-4 Complete Photo Etch Set	\$32.95
ER-2 Assorted Etch Resist Patterns & Tapes	4.95
ER-3 1/4 lb. Dry Ferric Chloride (makes one pint)	2.25
ER-5 Six sheets Pos-Neg Copy Film, 5"x6"	5.95
ER-6 Film Process Chemicals	2.75
ER-71 Photo Resist Liquid (negative) does 1700in ²	6.95
ER-8 Photo Resist Developer, 16 oz.	3.50
ER-12 Power Etch bubble pump unit*	7.25

*not included in ER-4 set

the **DATAK** corp. ✓ 24
65 71st St. • Guttenberg, N. J. 07093

64K MEMORY FOR THE HEATHKIT H8^{*} COMPUTER

Assembled	Kit	
\$500	\$415	64K (56K)
440	360	48K
380	305	32K
320	250	16K

Memory Expansion Kit - 16K \$ 60
PC Board Only - With Documentation \$ 50

Phone for Free Brochure 714/830-2092

*HEATHKIT and H8 are Registered Trademarks of the Heath Co.



**TRIONYX
ELECTRONICS**

BOX 5131-B, SANTA ANA, CA 92704

Model III, 4K.....	\$629.10
Model III, 16K.....	\$899.10
Model III, 32K.....	\$2245.50
Model II, 32K with 1 disk drive.....	\$3105.00
Expansion Interface.....	\$269.00
Expansion Interface 16K.....	\$403.20
Expansion Interface 32K.....	\$524.00
16K Memory Kit for TRS-80 or Apple.....	\$79.95



TRS-80 & NORTH STAR ADD-ON DRIVES

We carry California Computer Systems for Apple & TRS-80

CUSTOM ENCLOSURE



CABLE INCLUDED

Single drive system in custom enclosure.....	\$400.00
Single drive system in metal enclosure.....	\$375.00
Double drive system in custom enclosure.....	\$806.00

MPI.....	\$275.00
MPI B52, dual headed.....	\$349.00
Shugart SA400.....	\$275.00
Shugart SA800.....	\$479.00
Tandon single sided.....	\$279.00
Tandon double sided.....	\$425.00
Hazeltine 1000.....	\$450.00
Single tier walnut enclosure for Shugart.....	\$ 35.00
Double tier walnut enclosure for Shugart.....	\$ 59.00
Atari 400.....	\$548.49
Atari 800.....	\$795.00
Hazeltine 1410.....	\$749.00
Centronics PI Printer (TRS-80 add on).....	\$398.95
Centronics 779-2 tractor (TRS-80 add on).....	\$1049.95
TI Printer.....	\$1599.00
Base 2.....	\$649.00
Horizon 1, 32K.....	\$2290.00
Televideo 912.....	\$775.00
SPECIAL! MINI FLOPPY DISKS, box of 10 (with plastic box) only \$28.00 (without plastic box) only \$26.50. Box of 10, 8" disks (in plastic box \$30.00). Centronics 779 ribbons \$3.50 each.	

torasystems INC

✓ 65

WE ACCEPT BANK AMERICARD, VISA, MASTER CHARGE

29-02 23rd Ave., Astoria, N.Y. 11105
TWX 7105822107 (212) 728-5252
(800) 221-1340

COMPUTER CLINIC

I have recently changed my CPU computer board from an 8080A to a Z-80 and now find that my Altair Extended BASIC will not run. Does anyone know of a "patch" to Altair BASIC which will allow it to run on the Z-80?

George R. Steber
9957 N. River Road
Mequon, WI 53092

I need schematics and service data for a Tektronix 31 calculator and Tektronix 4661 digital plotter. Attempts to get this information from Tektronix have been unsuccessful.

Kenneth H. Reid
1935 Trevillian Way
Louisville, KY 40205

I need a BASIC interpreter (preferably 8K or larger) on Tarbell cassette suitable for use with an Imsai 8080. I also

want the source code listing, if available. Since I live in Saudi Arabia, where computing materials are unobtainable, any help would be much appreciated.

Richard Herman
c/o Donald Herman
Thor Johnson Dorm
Interlochen Arts Academy
Interlochen, MI 49643

I have acquired two eight-inch single-sided disk drives, which, I believe, might be IBM and are marked "33FD," but I have no data on them. I would be grateful if any reader of *Microcomputing* could assist me with any relevant data—particularly details of the pin-outs from the 24-pin connectors on the side of them.

Rory O'Farrell
Tinode
Blessington
Co. Wicklow
Ireland

Super Special Apple II 16K \$1075. reg. 1195.00

INTEGRAL DATA SYSTEMS

440G: Paper Tiger with Graphics, 2K Buffer	\$950 reg. \$1095
460: Word Processing Quality	\$1099 reg. 1295
460G: IDS 460 w/Graphics	\$1199 reg. 1395

Centronics 737 High Quality Dot Matrix	\$895 reg. 995.00
Apple Silentype includes interface and graphic capabilities	\$535 reg. 595.00

Apple Parallel Int.	\$160 reg. \$180
Apple Serial Int.	\$175 reg. \$195
Centronics Parallel Int.	\$185 reg. \$225

DOUBLE VISION	\$295.00
DISK II with controller	\$525.00
without controller	\$445.00
MICROMODEM	\$325.00
PASCAL	\$425.00
LEEDEX MONITOR	\$140.00
KG-12C Green Phosphor 12" Screen w/Glare Cover 18 MHz bandwidth	\$275.00

**16K RAMS for
APPLE II
TRS-80 \$59**

**VERBATIM
DISKS
10 for \$27**

The Computer Stop
16919 Hawthorne Blvd.
Lawndale, CA 90260
(213) 371-4010

✓ 105

**MON. - SAT.
10-6**

CLUB NOTES

Hamilton, Ontario

The OSI User's Group of Southern Ontario will hold its next meeting on Saturday, March 7, from 10 a.m. to 4 p.m., at McMaster University, General Sciences Building, Room 312. Meeting dates for the remainder of 1981 are June 6, September 5 and December 5. For more information, contact Dr. N. Solntseff or C. Bryce, Unit for Computer Science, McMaster University, Hamilton, Ontario L8S 4K1, 416/525-9140, ext. 4689 or 2065.

Delaware Valley

Computer owners of the Delaware Valley should note the existence of the TRS-80 User's Group of Delaware. Contact Tim, 302/478-7415; Merle, 302/366-0785; or Al, 302/762-4223.

Rochester, NY

The Rochester Area Microcomputer Society will hold its third annual spring computer show on April 4 at the Perinton Square Mall, corner of Rts. 250 and 31, Fairport, NY, near Rochester. For further information, contact the Rochester Area Microcomputer Society, PO Box 90808, Rochester, NY 14609, or call Erwin Rahn, president, 716/473-3184.

New Orleans, LA

The Texas Instruments Minicomputer Information Exchange (TI-MIX) will hold a conference for users of Texas Instruments computer equipment on March 8-11 at the Marriott Hotel in New Orleans. Further information is available from TI-MIX, PO Box 2909, Austin, TX 78769, 512/250-7151.

This is a partial listing of over 500 items available from 500 authorized Jim-pak Distributors:

TTL			
7400	2/.85	7490	.85
7402	2/.85	7493	.85
7404	2/.85	74100	2.25
7406	2/1.19	74109	2/1.19
7407	2/1.19	74121	.69
7408	2/.85	74123	.99
7410	2/.85	74150	1.95
7414	.99	74154	1.95
7417	2/1.10	74157	.99
7420	2/.85	74161	1.19
7447	1.19	74164	1.59
7474	.69	74174	1.59
7475	.79	74175	1.49
7476	.69	74192	1.19
7485	1.19	74193	1.19
7486	2/1.19	74367	.99
7489	2.99	74393	1.95



GB100 Cer. Caps. (100)	2.95	GB123 Heat Sinks (30)	3.95
GB101 Mylar Caps. (60)	4.95	GB127 Transistors (100)	3.95
GB102 Electrolytics (60)	4.95	GB137 Chokes (50)	3.95
GB103 Tantalums (40)	4.95	GB139 Term. Strips (40)	3.95
GB108 TTL IC's (50)	4.95	GB140 Spcr/Stndff (150)	2.95
GB110 Asst. LEDs (100)	5.95	GB141 Washers (200)	2.95
GB113 Trimmers (30)	4.95	GB145 Lugs (100)	2.95
GB116 1/4w Resist. (200)	2.95	GB154 1/2w Resist. (100)	2.95
GB117 1/2w Resist. (200)	2.95	GB162 7-Seg. Dsply. (50)	5.95
GB120 Slide Switch (25)	3.95	GB173 3/8" Pots. (100)	5.95

LS Schottky			
74LS00	.55	74LS109	.79
74LS02	.55	74LS123	1.95
74LS04	.69	74LS138	1.49
74LS08	.55	74LS139	1.49
74LS10	.55	74LS154	2.49
74LS14	1.09	74LS157	1.49
74LS30	.55	74LS161	1.79
74LS32	.69	74LS174	1.79
74LS38	.69	74LS175	1.79
74LS42	1.49	74LS192	1.89
74LS47	1.79	74LS193	1.89
74LS48	1.79	74LS221	1.95
74LS73	.79	74LS244	2.49
74LS74	.79	74LS245	3.49
74LS75	.99	74LS367	2.49
74LS85	1.95	74LS374	2.49
74LS90	1.09	81LS97	2.49

POTENTIOMETERS

2 Watt @ 70°C
7/8" Slotted Shaft
Linear Taper

1K 5K 10K
25K 50K 100K
1 Meg

CMU .. \$2.95

3/4 Watt @ 70°C
15 Turn Pot.
Linear Taper

100Ω 500Ω 1K
5K 10K 50K
100K 500K 1Meg

830P .. \$1.79

REGULATED POWER SUPPLY KIT

Uses LM309K. Heat Sink provided. PC board construction. Provides a solid 1 amp @ 5 volts. Can supply up to ±5V, ±9V and ±12V with JE205 Adapter. Includes components, hardware and instructions.

3 1/2" x 5 1/2" x 2 1/2" H

JE200 \$14.95

SOCKETS

Low Profile	Wire Wrap
8 pin LP ... 2/.59	14 pin WW tin .75
14 pin LP ... 2/.69	14 pin WW gold 1.09
16 pin LP ... 2/.79	16 pin WW tin .79
18 pin LP ... 2/.89	16 pin WW gold 1.19
20 pin LP ... 2/.99	24 pin WW gold 1.69
22 pin LP ... 2/1.09	40 pin WW gold 2.75
24 pin LP ... 2/1.19	14 p. plug/cover 1.29
28 pin LP ... .82	16 p. plug/cover 1.39
36 pin LP ... .99	24 p. plug/cover 1.95
40 pin LP ... 1.19	Also, The Molex Line

CMOS			
4000	.69	4030	.79
4001	.69	4040	1.95
4002	.69	4044	1.39
4006	1.95	4046	2.49
4009	.89	4047	2.75
4010	.85	4049	.89
4011	.69	4050	.89
4013	.85	4051	1.95
4016	.85	4066	1.19
4017	1.49	4069	.79
4018	1.49	4070	.79
4020	2.19	4071	.79
4023	.49	4081	.69
4024	1.29	4093	1.19
4027	.89	4511	1.95

DESK TOP ENCLOSURES

DTE-8 (Pictured)	\$31.95
DTE-11 (Pictured)	\$34.95
DTE-14	\$36.95
DTE-HK (Case for JE600)	\$47.95
DTE-AK (Case for JE610) (Pictured)	\$52.95

DIODES & TRANSISTORS

1N751	2/.59	2N2219A	2/1.19
1N757	2/.59	2N2222A	2/.89
1N1188	2.69	2N2907A	2/.89
1N3600	5/.99	2N3055	.99
1N4001	4/.59	2N3772	2.25
1N4004	4/.69	2N3904	2/.69
1N4007	4/.79	2N3906	2/.69
1N4148	10/.99	2N4401	2/.79
1N4733	2/.69	2N4403	2/.79
1N4734	2/.69	2N5129	2/.69
1N4735	2/.69	2N5139	2/.69
1N4742	2/.69	2N5210	2/.79
1N4744	2/.69	2N5951	2/1.29

CONNECTORS

DB25P	D-Subminiature Plug	3.95
DB25S	D-Subminiature Socket	4.95
DB51226	Cover for DB25P/S	2.25
22/44SE	P.C. Edge	2.95
UG88/U	BNC Plug	2.19
UG89/U	BNC Jack	3.95
UG175/U	UHF Adapter	.59
SO239	UHF Panel Recp.	1.49
PL258	UHF Adapter	1.95
PL259	UHF Plug	1.95
UG260/U	BNC Plug	2.39
UG1094/U	BNC Bulkhead Recp.	1.49

JOYSTICKS

JS-100K	100K Linear Taper Pots	\$5.49
JVC-40	40K (2) Video Controller	5.95

CAPACITORS

Dipped Tantalum	ELECTROLYTIC
.1mfd @ 35V 2/.89	1mfd @ 50V 3/.69
.47mfd @ 35V 2/.89	4.7mfd @ 50V 2/.59
1mfd @ 35V 2/.89	10mfd @ 50V 2/.69
2.2mfd @ 25V 2/1.09	22mfd @ 50V 2/.79
3.3mfd @ 25V 2/1.19	47mfd @ 50V 2/.89
4.7mfd @ 25V 2/1.39	100mfd @ 50V .59
10mfd @ 25V 1.19	220mfd @ 50V .69
33mfd @ 25V 3.95	1000mfd @ 25V 1.19
	2200mfd @ 16V 1.39
100V MYLAR	50V CERAMIC
.001-.01mfd 4/.79	10pf-.022mfd 4/.59
.022mfd 4/.89	.047mfd 4/.69
.047mfd 4/.99	.1mfd 4/.79
.1mfd 4/1.19	
.22mfd 4/1.29	

LINEAR			
LM301N	.59	LM7805T	1.75
LM305H	1.39	LM7812T	1.75
LM307N	.75	LM7815T	1.75
LM308N	1.19	LM380N	1.49
LM309K	2.25	LM384N	2.49
LM310N	2.69	LM555N	.69
LM311N	1.49	LM556N	1.49
LM317T	2.29	LM565N	1.95
LM318N	2.95	LM566N	1.95
LM319N	2.95	LM567N	1.79
LM320K-5	2.25	LM723N	.79
LM7906T	1.75	LM741N	.65
LM7912T	1.75	LM1310N	2.95
LM7915T	1.75	LM1458N	.99
LM323K	5.95	LM1488N	1.59
LM324N	1.29	LM1489N	1.59
LM337T	2.29	LM1800N	4.49
LM339N	1.29	76477N	3.95

TOOLS

PCB-3	P.C. Board Vise	\$12.49
WS-150	5" Wire Strip./Cut. (12-24AWG)	3.99
SG-30	10" 110-120V 30W Solder Iron	7.50
SG-TIP	Replacement Tip for SG-30 S. Iron	1.25

WALL TRANSFORMERS

AC250	250mA 12VAC (117V/60Hz)	\$3.95
DV9200	200mA 9VAC (117V/60Hz)	3.95

MICROPROCESSORS

Z80A	CPU (4MHz)	14.95
MC6800	8 Bit MPU	14.95
8080A	CPU	7.95
8212	8 Bit I/O Port	3.95
8216	BI-Directional Bus Driver	4.49
2513/2140	Character Generator	12.95
8T97	Tri-State Hex Buffer	2.25
AY-5-1013	30K Baud UART	6.95
AY-5-2376	88-Key Keyboard Encoder	13.95
2114-3	4K Static RAM (300ns)	9.49
MK4116	16K Dynamic RAM (250ns)	9.95
2708	8K EPROM	10.95
2716	16K EPROM (+5V)	19.95

12VDC AUTOMOTIVE/INSTRUMENT CLOCK MODULE

300 GREEN DISPLAY

MA1003 \$19.95

Son of Cheap Video Interactive Computer Graphics Interfacing with the 8255 PPI

Son of Cheap Video

Don Lancaster
Howard W. Sams & Co., Inc.
\$8.95

Don Lancaster is a capitalist's capitalist. He fully understands the concept that to make money, you must find ways to not spend money. The result of Lancaster's capitalism has been a series of "you-build-it" hardware books. The latest in the series is *Son of Cheap Video*, a sequel to *The Cheap Video Cookbook*, a volume of video hardware fixes and modifications for the hardware freak.

In *The Incredible Secret Money Machine*, Lancaster asserts that the secret money machine is you, and your willingness to put your micro to work either by writing programs, taking care of the statistics for a local bowling league or designing hardware modifications that can make a microcomputer do more for less. In *Son of Cheap Video*, he is, once again, practicing what he preaches.

The concept of cheap video is simple—find new ways to get the output of a microcomputer onto an ordinary TV screen. This is done with a minimum of hardware and without major modifications to either the computer or the TV. Lancaster calls this concept "scungy video."

The advantages of scungy video, designed primarily for the KIM-1 and other 6502-based systems, are many. You can eliminate most of the address restrictions that cheap video imposes on your micro; scungy video techniques eliminate much of the interaction between the computer and the video circuitry, making the video hardware a mere add-on to the system; and you can eliminate one or both of the custom PROM memories used in cheap video.

Scungy video works by adding two new elements to the software scan microinstruction and hardware upstream tap that are the keys to cheap video. It eliminates the subroutine address space mapping used in cheap video and uses break

mapping for the scan microinstruction instead. Also, scungy video uses available parallel I/O ports to decrease special hardware needs.

With cheap video and scungy video, complex systems timing and separate display memory are not needed, because the system lets the computer do the work on a time-sharing basis with the programs in memory. The net result of these modifications is a video display system that can be built for as little as \$7.

And that's just the beginning. *Son of Cheap Video* will also show you how to achieve full transparency, which lets you compute and display at the same time. All it takes is a length of wire (used to make a sensor coil) and an extra CMOS gate. This new route to transparent cheap video is called the "snuffler" method. Or, if you need to deliver a message in Swahili, using Icelandic characters, *Son of Cheap Video* will show you how to generate custom characters and graphics. As an example of what you can do with the character generator, chapter 4 shows you how to put together a music display with a music staff; whole, half, quarter, eighth and sixteenth notes; measure symbols; treble and bass clefs and more.

Son of Cheap Video doesn't forget the 8080/Z-80 crowd, either. There are adaptations of cheap video for the Heath H8 on the hardware and software sides. In a similar vein, there are two chapters detailing a hardware/software modification to add lowercase capability to the Apple II. This lowercase modification uses the existing keyboard, and you add only two new ICs and a plug-in module. No foil cuts or PC board changes are necessary. Lowercase for the Apple is the crowning touch to this volume of high-tech fixes for the low-budget fixer and, by itself, justifies the purchase price of the book.

The book is profusely illustrated and contains the kinds of circuit diagrams that almost anyone can read. The information is accessible, and Lancaster's breezy style is often good for a chuckle or

two. There are armfuls of information packed on every page.

Don Lancaster knows that tomorrow's hardware innovators are today's low-budget hobbyists, and he has designed this and his other books to teach and encourage that audience of hardware bashers. As Lancaster warns in his introduction, "If you are not one of us, go away."

G. Michael Vose
Instant Software
Peterborough, NH

Principles of Interactive Computer Graphics

Second Edition
William M. Newman and Robert F. Sproull
McGraw-Hill, Inc., 1979
\$26.95

For anyone wishing to learn about computer graphics, *Principles of Interactive Computer Graphics* is the place. This book gives both comprehensive and detailed coverage of the current state of the art. And for a field as broad as computer graphics, that's an impressive achievement.

The book is broken into six sections: Basic Concepts, Graphics Packages, Interactive Graphics, Raster Graphics, Three-Dimensional Graphics and Graphics Systems. Basic Concepts is a brief overview of the hardware and software involved in displaying pictures on a screen. The organization of this section is typical of the rest of the book: it goes from easy (points and lines) to difficult (transformations, clipping, windowing). Nevertheless, the writing is clear and it is easy to skip around difficult or uninteresting sections without getting lost in the sections ahead.

Graphics Packages is about display files—how they are organized, constructed, compiled and used to represent geometric models and pictures. The hardware on which the discussion is based is often

Call For Manuscripts

Kilobaud Microcomputing is looking for business articles!

Businessmen in all fields are beginning to take notice of the microcomputer. They are eager to know which computers, peripheral equipment and applications software will let them take full advantage of this new tool. What knowledge do you have to share?

Here are the kinds of articles that we want you to write for us:

- Are you a businessman with a system up and running? We want to know how it works. What were your expectations? Have they been fulfilled? Did you find the software that you wanted? What problems have you had? How did you overcome them? What recommendations do you have for other businessmen?

- We want reviews from a businessman's perspective of specific hardware and software. If you've recently bought a new product and want to tell others how great—or poor—it is, *Microcomputing* will provide you with a forum.

- What programs have you written to meet your specific needs? Perhaps another businessman can use them, too. Even if he can't, your program may serve as a springboard for other ideas.

- Perhaps you aren't using your micro for business, but know a company that is. Trot on down with your pencil and notebook, and find out what they're up to. While they might not have the time to write up their experiences, they might be more than willing to tell somebody else about them. And an outside observer will often be able to see things with a unique and valuable perspective.

Don't worry if you're not a professional writer. That's what we editors are here for. And we'll be more than happy to send you a copy of our writer's guidelines.

Send your manuscripts and correspondence to:

Kilobaud Microcomputing
Pine St.
Peterborough, NH 03458

chapter 3, which deals exclusively with "unconditional" or "asynchronous" data transfer without handshaking. Various methods of configuring ports A, B and C are discussed. Examples throughout the book illustrate why a particular port configuration might be required. A program and timing diagram follows a section on how to configure the PPI for mode 0 I/O. Port C usage is illustrated with a block diagram, a subport allocation table and two programs. References precede the three experiments. A number of tables in the chapter are handy for reference.

Chapter 4 discusses and illustrates in great detail the PPI bit set/reset capability of port C in mode 0 operation. The reader is given an appreciation for the real-world interface capabilities of the 8255 by an application example.

Status-driven handshaking I/O with combined mode 0 and bit set/reset operation is covered in chapter 5. Handshaking is explained in words and diagrams, and contrasted to interrupt-driven systems in the same manner. Flowcharts are used to excellent advantage in explaining implementation of status-driven handshaking I/O. The interfacing example given in this chapter is a paper tape punch and reader. The experiment covers the subject matter in very good detail. The program examples and circuit diagrams are, as always, given in sufficient detail to let the reader wire-up the circuit and execute a working program without having to guess what the author had in mind and why it doesn't work.

Befitting the subject matter, interrupt-driven handshaking I/O, chapter 6 is the longest (52 pages) and most involved chapter. Since interrupt-driven systems are inherently complex, Goldsborough gives extensive attention to system timing considerations, interrupt service routines and associated hardware. Numerous illustrations explain the internal sig-

Program Conversions

Have you made any conversions lately? If so, *Kilobaud Microcomputing* wants to hear about them.

We're talking, of course, about converting programs found in the pages of *Kilobaud Microcomputing* for use on your system. Many fine programs have been published in the magazine, but they are of little use to you if they aren't compatible with your system.

If you have successfully converted a program for use on your system, why not send it in (listing and cassette or disk)? We'll check it out to see that it runs OK and prepare it for possible publication. This way, you'll be sharing your efforts with thousands of other users, who'll be able to add another selection to their program libraries. Of course, you will be rewarded handsomely for your efforts.

nal handling of mode 1 input and output operations. The book includes an example of a fully decoded keyboard and a video display, discusses the signal requirements and provides a program listing.

Concluding the example is a discussion of a design approach to using a PPI for mode 1 handshaking I/O. The discussion consists of guidelines that the reader should consider when designing a mode 1 PPI interface for any use, not just a keyboard and display. The five experiments are very comprehensive. As usual, schematics are given, in-depth questions are asked and the answers provided. Also, timing diagrams aid in comprehension.

Mode 2 (bidirectional I/O) operation is covered in chapter 7. The concept of master and slave CPUs is illustrated in this chapter. The discussion includes block diagrams, timing diagrams, operational sequence of events tables (those are invaluable to understanding the material), flowcharts and program examples. As always, the programs are well-documented to aid in understanding program flow.

The experiment illustrates the use of two 8080 microcomputers interfaced for bidirectional I/O, and shows the sequential transfer of data from the master to the slave and back. Unless you have access to another 8080-based system, merely reading the experiment must suffice. That is not to say, however, that nothing can be gained from the experiment if you don't happen to have an extra system. As with the other experiments, the reader can follow, and probably learn from, the experiment simply by reading the programs, circuit and timing diagrams and answering the questions.

Two appendices cover electrical characteristics and timing diagrams for the PPI and the 8255 control word and status word formats. I found that even with the PPI status and control word information included in appendix 2, it was convenient to dog-ear pages that explain the various format combinations. As with most other Sams books I've read, the index leaves something to be desired, although this one is better than most.

Although I thought I was familiar with the PPI operation, I learned quite a bit from the book. Even if you don't use an 8255 in your system, the material is presented in such a manner that you'll gain a familiarity with programmable peripheral interfaces. If you are designing an interface, you should be able to reduce the hardware complexity (and probably ease programming, too) after reading the book.

The book was well-written and well-composed. The examples and experiments not only reinforced the text, but also let the reader do some self-testing. To that end, the questions were for the most part in-depth enough to make the reader think further about the material.

J. C. Hassall
Blacksburg, VA

Suddenly Radio Shack's New TRS-80TM Color Computer is Even Better!

New Extended Color BASIC. Here's an advanced TRS-80 Color Computer that includes a 16K ROM Extended BASIC with advanced graphics, eight brilliant colors, and sound, for an unprecedented low price! You can draw fine lines, circles, rectangles, boxes and more with easy-to-use one-line commands. Four graphic modes with two color sets allow up to 49,152 programmable screen points (pixels). There are 255 separate tones for music or sound effects. All this on a 16K RAM machine (including video memory) loaded with the dynamic features a serious programmer demands. You get a 32x16 screen, multi-character variable names (two significant), editing, tracing, user-definable keys, 255-character string arrays, floating point 9-digit accuracy, and even machine language routines.

Priced at Only \$599, the TRS-80 Extended Color BASIC Computer is useful, entertaining and educational. Yet using it can be as simple as plugging in one of Radio Shack's instant-loading Program Paks. Come in and see what's already available. The computer attaches to your TV, or our own \$399 TRS-80 Color Video Receiver. For just \$24.95, you can add a pair of joysticks which add flexibility to games and video displays. A built-in serial interface lets you attach a printer or a modem. A tutorial Color BASIC instruction manual is included, of course.

More Good News. Extended Color BASIC is also available as an upgrade kit (\$99) for the 4K Color Computer (16K RAM required — \$119). There's a modest installation charge for each kit.



NEW

A Low-Cost, Direct-Connect Modem. A convenient alternative to an acoustic coupler. The TRS-80 Modem I lets you enter the world of microcomputer communication for only \$149. Cable extra.

Specifications. Low Power CMOS Circuitry. Full duplex. 300 baud. 103 compatible ANSI/ORIG. Sensitivity: -48 dB - 43 dB. Connectors: DB25 4 pin DIN. Includes interface for Model I cassette port. FCC approved.

Radio Shack
A DIVISION OF TANDY CORPORATION

8000 STORES, 120 COMPUTER CENTERS AND 130 SERVICE CENTERS NATIONWIDE

New TRS-80 VIDEOTEX Software (with the modem shown below) offers Color Computer owners quick, affordable access to many kinds of information and data services. For example, our exclusive agreement with CompuServe[®] Information Service gets you local, national and international news, weather and sports from 11 area newspapers and the Associated Press News Service; information on over 32,000 stocks and bonds; an educational reference service; entertainment news and reviews; nationwide Electronic Mail with other users; and much more! You'll also access Dow Jones Information Services for Wall Street news, stock quotes and more.

Only \$29.95 Buys You VIDEOTEX Software including a free hour on both CompuServe and Dow Jones, plus operator's manuals. Come see the new TRS-80 Color Computer, its programs and accessories, at one of our 6000 outlets today!



The home computer you thought was years away is here.



C8P DF

Ohio Scientific's top of the line personal computer, the C8P DF. This system incorporates the most advanced technology now available in standard configurations and add-on options. The C8P DF has full capabilities as a personal computer, a small business computer, a home monitoring security system and an advanced process controller.

Personal Computer Features

The C8P DF features ultra-fast program execution. The standard model is twice as fast as other personal computers such as the Apple II and PET. The computer system is available with a GT option which nearly doubles the speed again, making it comparable to high end mini-computer systems. High speed execution makes elaborate video animation possible as well as other I/O functions which until now, have not been possible. The C8P DF features Ohio Scientific's 32 x 64 character display with graphics and gaming elements for an effective resolution of 256 x 512 points and up to 16 colors. Other features for personal use include a programmable tone generator from 200 to 20KHz and an 8 bit companding digital to analog converter for music and voice output, 2-8 axis joystick interfaces, and 2-10 key pad interfaces. Hundreds of personal applications, games and educational software packages are currently available for use with the C8P DF.

Business Applications

The C8P DF utilizes full size 8" floppy disks and is compatible with Ohio Scientific's advanced small business operating system,

OS-65U and two types of information management systems, OS-MDMS and OS-DMS. The computer system comes standard with a high-speed printer interface and a modem interface. It features a full 53-key ASCII keyboard as well as 2048 character display with upper and lower case for business and word processing applications.

Home Control

The C8P DF has the most advanced home monitoring and control capabilities ever offered in a computer system. It incorporates a real time clock and a unique FOREGROUND/BACKGROUND operating system which allows the computer to function with normal BASIC programs at the same time it is monitoring external devices. The C8P DF comes standard with an AC remote control interface which allows it to control a wide range of AC appliances and lights remotely without wiring and an interface for home security systems which monitors fire, intrusion, car theft, water levels and freezer temperature, all without messy wiring. In addition, the C8P DF can accept Ohio Scientific's Votrax voice I/O board and/or Ohio Scientific's new universal telephone interface (UTI). The telephone interface connects the computer to any touch-tone or rotary dial telephone line. The computer system is able to answer calls, initiate calls and communicate via touch-tone signals, voice output or 300 baud modem signals. It can accept and decode touch-tone signals, 300 baud modem signals and record incoming voice messages.

These features collectively give the C8P DF capabilities to monitor and control home functions with almost human-like capabilities.

Process Controller

The C8P DF incorporates a real time clock, FOREGROUND/BACKGROUND operation and 16 parallel I/O lines. Additionally a universal accessory BUS connector is accessible at the back of the computer to plug in additional 48 lines of parallel I/O and/or a complete analog signal I/O board with A/D and D/A and multiplexers.

Clearly, the C8P DF beats all existing small computers in conventional specifications plus it has capabilities far beyond any other computer system on the market today.

C8P DF is an 8-slot mainframe class computer with 32K static RAM, dual 8" floppies, and several open slots for expansion.

Prices start at under \$3,000.

Computers come with keyboards and floppies where specified. Other equipment shown is optional.

For literature and the name of your local dealer, CALL 1-800-321-6850 TOLL FREE.

OHIO SCIENTIFIC

a **MACOM** Company

1333 SOUTH CHILLICOTHE ROAD
AURORA, OH 44202 • (216) 831-5600